AIRSPACE USE STUDY

UNIVERSITY
OF MICHIGAN
DEC 21 1956
MAIN
READING ROOM

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

ON

USE OF AIRSPACE

JULY 7, 18, SEPTEMBER 11, 12, AND 13, 1956

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[1] Died May 25, 1956.
[2] Died August 5, 1956.
[3] Appointed July 24, 1956.

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AIRSPACE USE STUDY

SATURDAY, JULY 7, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE OF THE COMMITTEE
ON INTERSTATE AND FOREIGN COMMERCE,
Las Vegas, Nev.

The subcommittee met at 10:30 a. m., pursuant to call, in the Gold Key Room, the Sands Hotel, Las Vegas, Nev., Hon. Oren Harris (chairman of the subcommittee) presiding.

Present: Representatives Harris (chairman of the subcommittee), Williams, Moulder, Rogers, Flynt, Macdonald, Hinshaw, and Hale.

Present also: Representative Teague of Texas.

Staff members present: Elton J. Layton, clerk, and Martin W. Cunningham, professional staff member.

Mr. HARRIS. The committee will come to order.

First, for the record, at the outset the members of the committee and others who are with our committee will be noted at this point.

The Committee on Interstate and Foreign Commerce of the House of Representatives, which has legislative jurisdiction over commercial aviation, at an executive session on Tuesday of last week directed the chairman, the Honorable J. Percy Priest, to name a special committee of the full committee to make an immediate inspection and preliminary investigation in connection with the use of airspace, air-traffic control, and other safety matters with reference to commercial aviation, and with particular reference to the unfortunate tragedy that occurred in this vicinity a week ago.

The members of the committee who are here today were selected as a special committee to undertake this investigation at the direction of our full committee.

We recognize full well the importance of this problem. It is not a new problem with us. The question of traffic control, air navigation aids and other safety problems, has been under active consideration by the committee for a number of years.

A little more than a year ago the Subcommittee on Transportation and Communications found it necessary to investigate the controversial question of air navigation aids. We held extensive executive sessions with representatives of all interested groups, including our military, civilian, and Government agencies, for the purpose of discharging a responsibility to help work out a very difficult problem.

It is unfortunate, most unfortunate, that the tragedy that occurred as it did Saturday of last week makes it necessary and imperative that this matter be pursued, and pursued as speedily as possible, and to such possible conclusions as can be reached to avoid any such future trage-

dies if at all possible. We know there are problems that must be met. We do not claim to know all the answers. In fact, that is the reason we are here and it is the reason we will give further consideration and study to this problem.

The primary purpose here is to establish, if we can, the relationship of the unfortunate tragedy to the problem airspace use and air traffic control. It is our hope that at this brief hearing in this vicinity we can first establish the facts regarding the incident of last week.

Then we hope that we might be able to establish for the record and for our information the chain of circumstances which led to the unfortunate accident. In addition to that, we also hope to establish some reasons why this situation developed and to get opinions from people who operate our civil airways as to how such a chain of circumstances can be avoided in the future.

We have a number of people here attending this hearing that should be noted for the record. I will hand to the stenographer a list of the names of the people from the Civil Aeronautics Board who are here, several of whom will be witnesses, and I will also hand to the stenographer a list of the names of the people who are here from the Civil Aeronautics Administration, a number of whom will be witnesses. Likewise, I will hand to the stenographer for the record a list of the names of those who are with the United Airlines and those who are with the Trans-World Airlines.

(The information referred to follows:)

CIVIL AERONAUTICS BOARD PERSONNEL PRESENT

James R. Durfee, Chairman, Civil Aeronautics Board
Franklin M. Stone, General Counsel
Ross I. Newmann, Chief, International and Rules Division, General Counsel's Office
William K. Andrews, Director, Bureau of Safety Investigation
William S. McNamara, Investigator, Bureau of Safety Investigation, Operations Group
Raymond P. Parschall, investigator in charge, Kansas City Region, Bureau of Safety Investigation
Robert W. Chrisp, Chief, Hearing and Reports Division, Bureau of Safety Investigation
Oscar Bakke, Deputy Director, Bureau of Safety Regulation
Robert G. Carnahan, Chief, General Rules Division, Bureau of Safety Regulation

PERSONNEL PRESENT FROM CIVIL AERONAUTICS ADMINISTRATION

James T. Pyle, Deputy Administrator, Civil Aeronautics Administration
David D. Thomas, Director, Air Traffic Control
William B. Davis, Director, Office of Aviation Safety
Ward B. Masden, Chief, Air Carrier Safety Division
Gerald F. White, Office of the General Counsel, Washington
Leonard Ashwell, Chief, Air Carrier Division, Fourth Regional Office, Los Angeles, Calif.
Jack Brown, Air Carrier Division, Fourth Regional Office, Los Angeles, Calif.
John A. Garrison, Chief, Facilities Operations Branch, Fourth Regional Office, Los Angeles, Calif.
John N. Denend, airways operations specialist (airport), Los Angeles tower
Leo LaPorte, airways operations specialist (airport), Los Angeles tower
Willis E. Jennings, airways operations specialist (airport), Los Angeles tower
William S. Hunter, airways operations specialist (airport), Los Angeles tower
Dorothy A. Davis, airways operations specialist (air route), Los Angeles Center
Robert C. Bartley, airways operations specialist (air route), Los Angeles Center

Lynn H. McCreary, airways operations specialist (air route), Salt Lake City
Herbert Dennis, aircraft communicator, Needles, Calif.
L. W. Burton, Office of the Under Secretary of Commerce

PERSONNEL PRESENT FROM THE DEPARTMENT OF THE ARMY

Capt. Walter Spriggs, Jr., helicopter pilot

PERSONNEL PRESENT FROM UNITED AIR LINES, INC.

Charles F. McErlean, vice president, assistant to the president
Daniel C. Lynch, assistant to the vice president, flight operations
J. M. Klapp, assistant to the president
William M. O'Hern, assistant director, publicity

PERSONNEL PRESENT FROM TRANS WORLD AIRLINES

Gordon Gilmore, public relations
Harry West, legal
Frank E. Busch, operations

Mr. HARRIS. Our first witness will be Mr. William K. Andrews, Director of the Bureau of Safety Investigation.

Mr. Andrews, will you come around, please.

It might be said that Mr. Andrews is the Chief of the Bureau of Safety Investigation of the Civil Aeronautics Board and in charge of the investigation underway at the scene of the tragedy that occurred last week.

Mr. Andrews, you may proceed.

STATEMENT OF WILLIAM K. ANDREWS, DIRECTOR, BUREAU OF SAFETY INVESTIGATION, CIVIL AERONAUTICS BOARD

Mr. ANDREWS. Yes, sir. In what manner would you desire me to proceed?

Mr. HARRIS. Mr. Andrews, I understand that you have been in charge of the investigation.

Mr. ANDREWS. That is correct, sir.

Mr. HARRIS. That is, the investigation that has been underway for the last several days in connection with the air tragedy in the Grand Canyon.

Mr. ANDREWS. Yes, sir.

Mr. HARRIS. It is our hope, as we indicated a moment ago, to first establish such facts in relation to the tragedy as we can. We would also like for you to give us such information as you can regarding the weather conditions in the area where this occurred, and such other facts leading up to this incident for the record and our information in order that we can get a correct picture and a continuity of the incidents as much as possible.

Mr. ANDREWS. Thank you, sir.

When this accident occurred——

Mr. HARRIS. I think you had better, for the record, establish the dates.

Mr. ANDREWS. Very well, sir.

I have a document here that I would like to read which is the preliminary information I got on this accident and which was transmitted to the Board. I think it will answer the identification and the dates and everything that you might desire, if I may read it, sir.

Mr. HARRIS. Very well; you may proceed.

(Mr. Andrews submitted the accompanying chart for the record.)

Mr. ANDREWS (reading):

Subject: Accident Notification—Preliminary Information, UAL DC–7 and TWA Super Constellation, Frand Canyon, Ariz., June 30, 1956.

TWA flight 2, a Lockheed 1049, departed Los Angeles International Airport at 1001 Pacific, June 30, 1956, for a nonstop flight to Kansas City, Mo. (Scheduled departure time was 0930 Pacific.) On board were 63 passengers and a crew of 6—Capt. Jack Gandy, First Officer J. Rittner, Flight Engineer F. Breyfogle, Stewardesses B. M. Davis and T. Armbrewster, and an extra first officer named Allen.

The flight was cleared IFR to Kansas City Airport to climb VFR to 19,000 feet via Green Airway 5 and Amber Airway 2 to Daggett, Calif., then direct to Trinidad, Colo., to maintain 1,000 feet on top. (Flight 2 had requested 19,000 feet, but ATC was unable to grant it and cleared them 1,000 feet on top.)

Understand, sir, this may be changed by some witness from the Board due to further investigation.

The last heard of the flight was——

Mr. HALE. May I interrupt there?

Mr. HARRIS. Mr. Hale.

Mr. HALE. Did you say a thousand feet on top?

Mr. ANDREWS. Yes, sir. That means on top of the cloud deck, sir.

The last heard of the flight was when it reported over Lake Mohave intersection at 1055 at 21,000 feet, 1,000 feet on top, estimating Painted Desert at 1131.

Approximately 3 minutes later, after the TWA flight took off, UAL flight 718, a DC–7, departed Los Angeles International Airport for a nonstop flight to Chicago, Ill. (Scheduled departure time was 0945 Pacific.) On board were 53 passengers——

Mr. FLYNT. Is that daylight or standard?

Mr. ANDREWS. Airlines operate on daylight-saving time, depending on the locality. [Reading:]

On board were 53 passengers and a crew of 5—Capt. R. F. Shirley, First Officer R. W. Harms, Flight Engineer G. Flore, and Stewardesses M. L. Kemintz and M. A. Shoudt.

The flight was cleared IFR to Chicago, to climb VFR to 21,000 feet and maintain that altitude via Green Airway 5, Palm Springs direct to Needles, Calif. The last heard from the flight was when it reported over Needles at 1058, cruising at 21,000 feet, estimating Painted Desert at 1131.

Mr. WILLIAMS. At that point, what had the TWA flight reported as its ETA for Painted Desert?

Mr. ANDREWS. As I recall, sir, it was at 1055.

Mr. FLYNT. By the notes I took, the TWA estimated to arrive Painted Desert at 1131 and UAL estimated to arrive Painted Desert at 1131. Those are the notes I took.

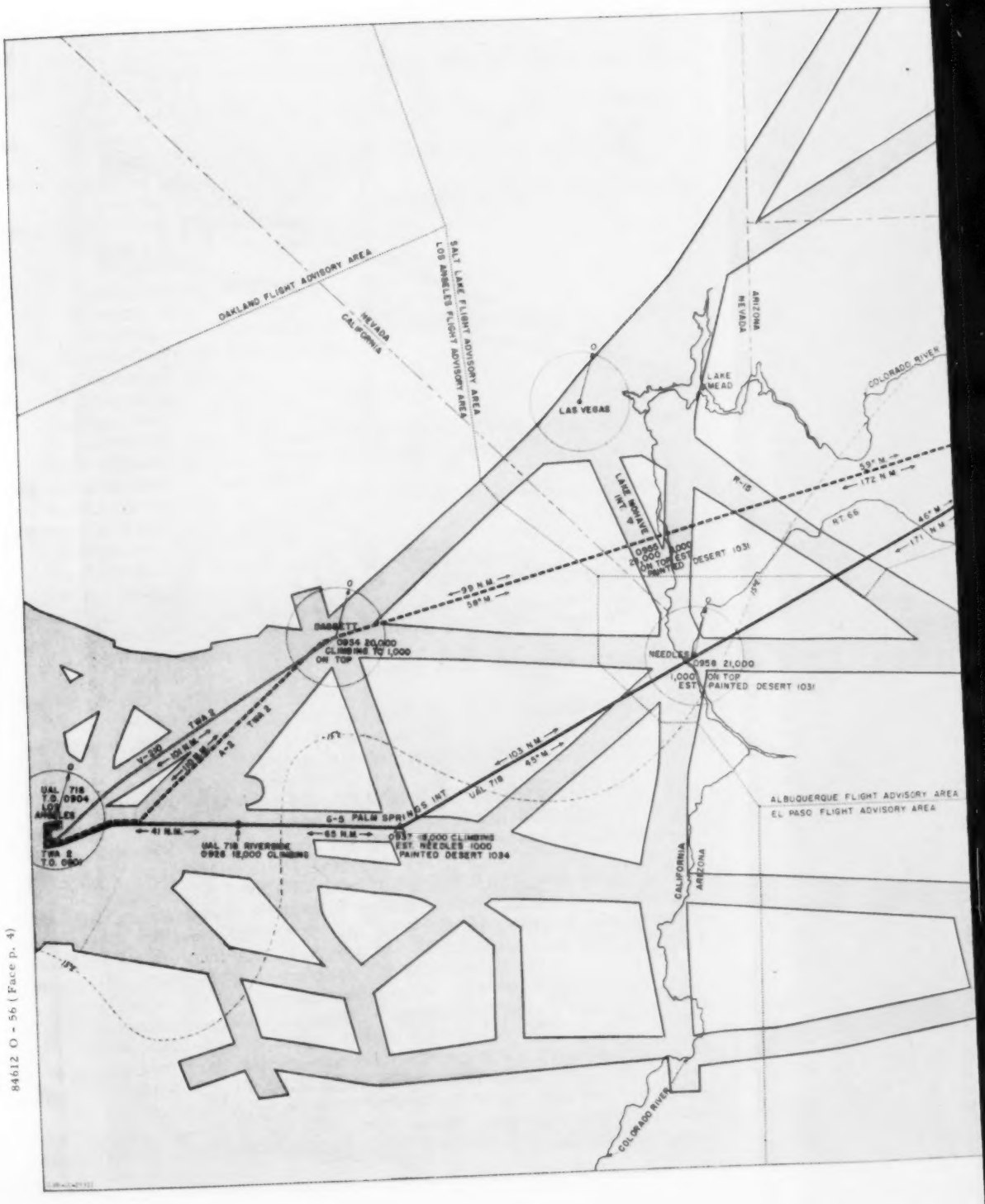
Mr. ANDREWS. Yes, sir; that is correct. But I think the question was what time did he report.

Mr. WILLIAMS. No, the question was what time did he report his ETA for Painted Desert.

Mr. ANDREWS. No, I misunderstood. I thought it was the time they made that estimate.

Actually, I believe TWA reported their estimate over Lake Mohave at approximately 1055 and United reported that estimate, as I recall, at 1058, sir.

Mr. FLYNT. Thirty-eight or fifty-eight?



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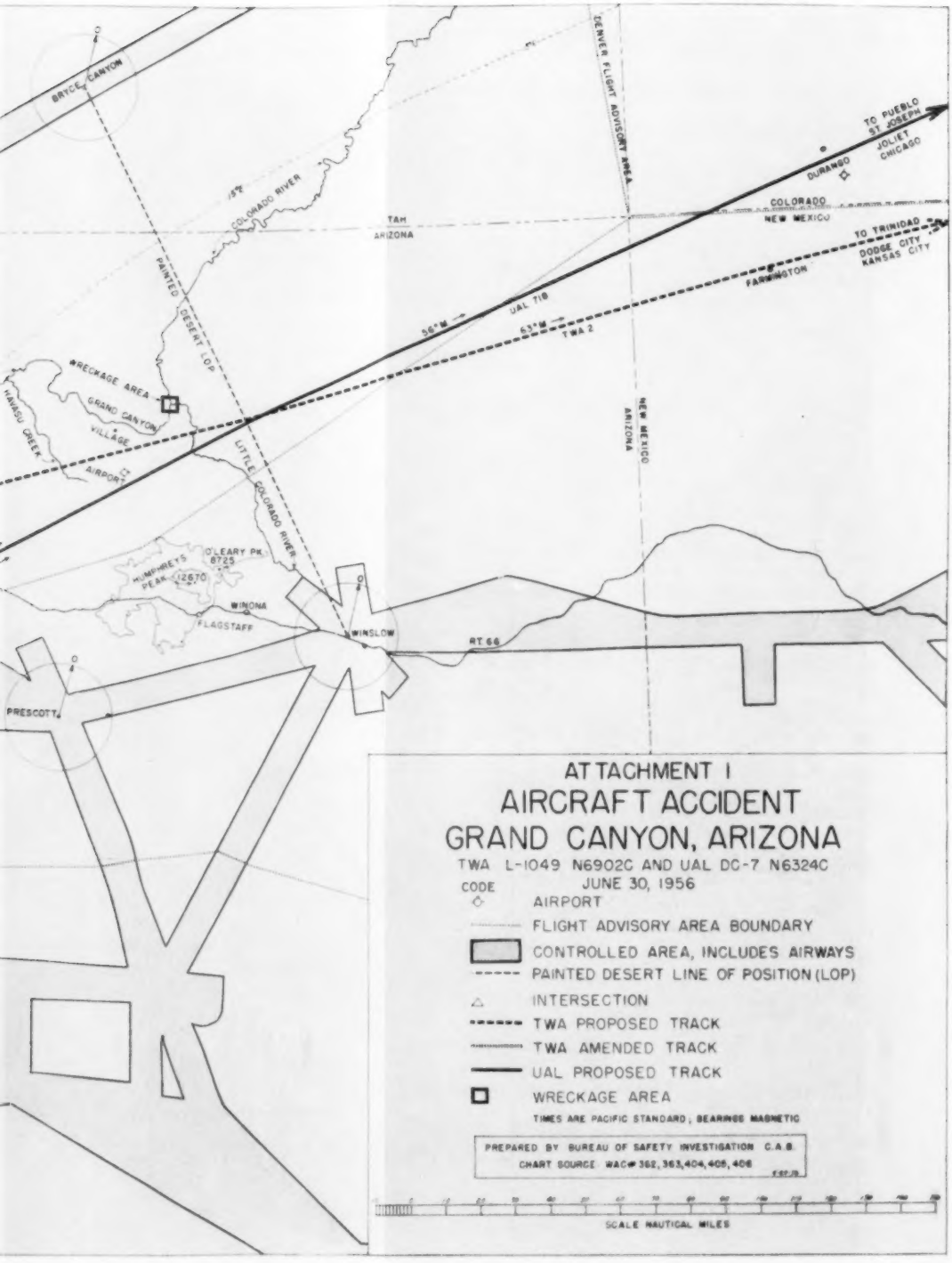

BRYCE CANYON
COLORADO RIVER
PAINTED DESERT LOP
TAM
ARIZONA
DENVER FLIGHT ADVISORY AREA
TO PUEBLO
ST JOSEPH
JOLIET
CHICAGO
DURANGO
COLORADO
NEW MEXICO
TO TRINIDAD
DODGE CITY
KANSAS CITY
FARMINGTON
UAL 718
TWA 2
WRECKAGE AREA
GRAND CANYON
VILLAGE
AIRPORT
HAVASU CREEK
LITTLE COLORADO RIVER
NEW MEXICO
ARIZONA
O'LEARY PK
6725
HUMPHREYS
PEAK 12670
WINONA
FLAGSTAFF
WINSLOW
AT 66
PRESCOTT
ATTACHMENT I
AIRCRAFT ACCIDENT
GRAND CANYON, ARIZONA
TWA L-1049 N6902C AND UAL DC-7 N6324C
JUNE 30, 1956
CODE
AIRPORT
FLIGHT ADVISORY AREA BOUNDARY
CONTROLLED AREA, INCLUDES AIRWAYS
PAINTED DESERT LINE OF POSITION (LOP)
INTERSECTION
TWA PROPOSED TRACK
TWA AMENDED TRACK
UAL PROPOSED TRACK
WRECKAGE AREA
TIMES ARE PACIFIC STANDARD; BEARINGS MAGNETIC
PREPARED BY BUREAU OF SAFETY INVESTIGATION C.A.B.
CHART SOURCE WAC# 362, 363, 404, 405, 406
SCALE NAUTICAL MILES

Mr. ANDREWS. Fifty-eight, I believe, just about 3 minutes between the two flights at the time they reported.

Mr. FLYNT. That is what I am getting at, 1055 and 1058 or 1035 and 1038? Which is it?

Mr. ANDREWS. May I have that chart? If I may, I have it drawn out.

Mr. WILLIAMS. Mr. Andrews, both of them reported their ETA for Painted Desert at the same time?

Mr. ANDREWS. Approximately 3 minutes difference, estimating to arrive at Painted Desert at 1131.

Mr. FLYNT. At the same time?

Mr. ANDREWS. Yes.

Mr. MOULDER. Mr. Chairman?

Mr. HARRIS. Mr. Moulder.

Mr. MOULDER. At the time they made their report, did they report the altitude that they were flying?

Mr. ANDREWS. Yes, sir.

TWA reported at 21,000, 1,000 feet on top.

Mr. MOULDER. And the other one?

Mr. ANDREWS. And United, who was flying IFR, reported 21,000.

Mr. MOULDER. In other words, they both reported they were flying on the same level at that time?

Mr. ANDREWS. Yes, sir; but there was considerable separation between the flights at that time.

Mr. ROGERS. How much do you estimate, Mr. Andrews?

Mr. ANDREWS. I have correct information here.

TWA reported over Lake Mohave at 1055 and United reported over Needles, which is 40 miles south of that point, at 1058.

Mr. MOULDER. May I pursue that point, Mr. Chairman?

Mr. HARRIS. Mr. Moulder.

Mr. MOULDER. How far was that point from the place where they would cross or intersect?

Mr. ANDREWS. I will have to measure it. It is approximately 170 nautical miles.

Mr. HINSHAW. I would like to establish something.

Mr. HARRIS. Mr. Moulder had another question.

Mr. MOULDER. When that report was sent in, what action was taken to advise them of their relative positions and the dangers that might be encountered by flying on the same level where, within a short period of time, they would intersect?

Mr. ANDREWS. I would rather that question be answered by Mr. McNamara, because I was going to have a briefing session this morning. He has been working in Los Angeles, the point of origin, gathering this information. And, frankly, the information I might give you might be purely hearsay at this time.

Mr. HARRIS. Mr. McNamara is here.

Mr. ROGERS. Would the gentleman yield?

Mr. MOULDER. I yield back.

Mr. ROGERS. Has it been customary for planes on these flights to fly at that same altitude? Has it been usual or unusual?

Mr. ANDREWS. That is a rather difficult question, sir, for the reason that one flight was under IFR, instrument clearance, and the other flight was under VFR clearance 1,000 feet on top and was supposed to be in the clear.

I do not think it would be unusual for flights to be flying at 21,000 feet on that route.

Mr. ROGERS. Did he report that he was flying 1,000 feet over the top or that he was flying at 22,000 feet?

Mr. ANDREWS. As I understand it, sir, TWA reported that he was flying at 21,000 feet, 1,000 feet on top.

Mr. MACDONALD. Would the gentleman yield?

Mr. ROGERS. Yes.

Mr. MACDONALD. You said the second flight left IFR and then went VFR to 21,000, and you did not finish whether it went back on IFR or not.

Mr. ANDREWS. As I understand the picture, United was a continued IFR flight, even though it passed out of the control zones. It was under IFR control as it crossed the airways.

TWA climbed VFR to 21,000 feet, requesting clearance, and they were given clearance, as I understand it, a thousand feet on top, which did not specify any particular altitude. The captain was then free to go up and down as long as he stayed in compliance with existing regulations.

Mr. FLYNT. Which provides a certain distance between planes?

Mr. ANDREWS. No, between the clouds and other obstructions so that he could observe other flights.

Mr. MACDONALD. Maybe I still do not understand. But did the second flight go back on IFR after it hit 21,000 feet?

Mr. ANDREWS. No, sir.

Mr. MACDONALD. It did not?

Mr. ANDREWS. No, sir.

You are referring to TWA?

Mr. MACDONALD. That is the second flight?

Mr. ANDREWS. That was the first flight off.

Mr. MACDONALD. The first flight off left VFR and was going to stay on VFR?

Mr. ANDREWS. That is correct.

Mr. MACDONALD. I am talking about the second flight.

Mr. ANDREWS. The second flight climbed VFR to its altitude and then was given IFR clearance.

Mr. HINSHAW. Mr. Chairman?

Mr. HARRIS. Mr. Hinshaw.

Mr. HINSHAW. I would like to establish the fact of this line between Bryce Canyon and Winslow, which I understand is a position reporting line called and referred to in the Civil Aeronautics Administration and Board as the Painted Desert reporting point. Is that correct?

Mr. ANDREWS. Yes, sir. I think that is 321° from Winslow.

Mr. HINSHAW. What means has the pilot of establishing himself on that line or near it?

Mr. ANDREWS. Well, sir, I haven't had that information and I would rather for the CAA to answer that. Or Mr. MacNamara may have that information for you.

Mr. HINSHAW. Is it to be established, we will say, by automatic direction finder, by the position of omniranges, or what?

Mr. ANDREWS. I don't want to evade you, but I would hate to say what the pilots in United were doing or what the pilots in TWA were

following, since I don't have the manuals or have it checked at this time, sir.

Mr. HINSHAW. That is a position-reporting point.

Mr. ANDREWS. Yes, sir.

Mr. HINSHAW. At any time when they cross this line or propose to cross the line, they are expected to report their expectation of time?

Mr. ANDREWS. That is correct, sir.

Mr. HINSHAW. Or their estimated time of arrival at that line?

Mr. ANDREWS. That is correct.

Mr. HINSHAW. Is that customary in the flying business?

Mr. ANDREWS. It is customary for the pilot to keep the company advised at all times.

Mr. HINSHAW. The company?

Mr. ANDREWS. The companies, as to the progress of the flight.

As to whether that is transmitted to CAA I don't know.

Is it, Bill?

Mr. MCNAMARA. It is advisory from the company.

Mr. HINSHAW. But it is not required?

Mr. ANDREWS. I don't think so.

Mr. HINSHAW. In other words, each company might know that its plane was due to arrive at Painted Desert, someplace along this line from Bryce Canyon to Winslow at a certain given time, but the other company might not?

Mr. ANDREWS. That is correct, sir, unless it was coordinated through Air, Inc., or some CAA facility.

Mr. HINSHAW. But it is not required in their traffic control or any rule of the Civil Aeronautics Administration or Board?

Mr. ANDREWS. I would rather for Mr. Bakke to answer that question, sir.

Mr. HINSHAW. We will ask him when we get around to him.

Mr. ANDREWS. My understanding is that it is not, sir.

Mr. HINSHAW. We also established the fact that neither of these planes were under control of airways-traffic control after they left what point or points?

Mr. ANDREWS. Well, I believe that United was under air traffic control at any time it crossed the airways. However, TWA was not at any time, because it was climbing VFR, along the airways.

Mr. HINSHAW. Were they required by the rules of the Civil Aeronautics Board to report at any point other than the Painted Desert, other than to their own company, after they had crossed the airway from Las Vegas to Winslow?

Mr. ANDREWS. As I understand it, sir, United went out of the Los Angeles control and temporarily, after coming out of that control zone, then went over into Needles. He went out again and in again and then he was in the advisory of Albuquerque as he proceeded along the flight path.

Mr. HINSHAW. I wanted to find out whether there is any procedure which would make certain that a flight in an uncontrolled area, such as the Painted Desert country, by one carrier would be acknowledged to another carrier.

Mr. ANDREWS. As I understand it, sir, there is none. However, in this case I understand that TWA was advised that United was traffic. However, we have not found—and, of course, you understand we are

still checking—but we have not found any indications that United was advised that TWA was traffic.

Mr. HINSHAW. But there is no requirement that they should be advised; is there?

Mr. ANDREWS. No, sir.

Mr. HINSHAW. And this is a long line from Winslow to Bryce Canyon, I take it from the map. It must be several hundred miles.

Mr. ANDREWS. Yes, sir.

Mr. HINSHAW. That is all.

Mr. HARRIS. You may proceed.

Mr. ANDREWS. Thank you, sir.

Immediately upon receiving notice of this accident, we started our people moving. We knew approximately the area that it was, from the last report that we had had from the flights, and we bracketed from the Oakland office, the Los Angeles office, and our Kansas City office and got men moving, because at that time we did not know where the aircraft were. We knew they were missing.

When the aircraft were locted, we found out that they were in a very inaccessible area, and therefore security which we normally establish was not possible.

I immediately designated Mr. R. P. Parschall as investigator in charge, recalled Mr. Leon H. Tanguay, chief of the technical division, from leave, and made him supervisory representative of the Washington office to coordinate and assign men from Oakland and Washington to participate in the investigation.

Actually, we have a wide area to cover, not only the scene of the accident, but I had to dispatch men to Los Angeles, the origin of the flights. I got in touch with the Administrator and requested the he impound the records, since I felt that all his records were extremely valuable, and to make up a duplicate with CAA observers of all known records, tape recordings, so that in playing back we could play back the duplicate rather than the original which I thought it was very important to maintain strict security on.

We established headquarters at 1 or 2 places. We moved because of trying to get both United and TWA together. Finally we got headquarters at Grand Canyon.

We established the witness group, hoping that maybe we could find some witnesses. We established a structures groups and we established an operational group as to the operation. And then I made a special group which is under Mr. McNamara, and that was on dispatch traffic control, and communications, and will cover practically all the questions that you people have been asking me here this morning. We made a special committee out of that.

At the present time, sir, we are continuing with our investigation. We are making it just as fast as we can because we realize the importance. However, all of the bodies are not out of the wreckage yet. We have secured certain parts of the aircraft which are under guard, both aircraft, for further examination and technical analysis. We have requested certain records from both companies. We have given them a deadline, but I will have to withdraw that deadline; and I was going to talk it over with them today.

We are progressing quite satisfactorily.

I would like to mention that the United States Army has done some really outstanding work, and all the credit for getting into the scenes of the crashes under those hazardous conditions belongs to them. These boys are risking their necks every day going in and making many trips, which they can only do early in the morning. I have only the highest praise for them.

I understand that you gentlemen have the operations man here and I hope you will be very kind to him because he is a grand boy and doing a wonderful job.

Mr. HARRIS. Mr. Andrews, you have not mentioned anything about the weather conditions.

Mr. ANDREWS. I am sorry, sir. I have requested pilot reports. The information I have at this time is that there was a possible thunderstorm in the area. That has not been verified. I have pilot reports that the tops were about 20,000 with columns going up to 22,000.

Mr. HINSHAW. But you could fly around the columns?

Mr. ANDREWS. Yes, sir; you could go around the columns.

I have not received the actual reports. It has purely been reported to me by American Airlines, United Airlines, and we have requested statements from the pilots flying through there.

Mr. HINSHAW. What were the weather sequences? Have they been gathered?

Mr. ANDREWS. Yes, sir.

We have a meteorologist with the Board but he is on leave. However, the Weather Bureau has lent me a man. He is working in my office gathering all that information at this time.

I believe the ceiling from the ground was approximately 2,000 feet.

We have covered the area very, very carefully, and we have found no witnesses that saw this at this time.

Mr. ROGERS. Mr. Chairman.

Mr. HARRIS. Mr. Rogers.

Mr. ROGERS. Mr. Andrews, how many other commercial planes were in that area at the time?

Mr. ANDREWS. I understand, sir, that there were several other flights, some of much as an hour and some as much as a half hour in difference between those flights. However, I do not have that information at this time.

Mr. ROGERS. Were they on the same flight routes or north or south of these?

Mr. ANDREWS. I cannot answer that, sir, because I do not know.

Mr. FLYNT. I have a question, Mr. Andrews. This was not clear to me in your initial statement.

Did both of these planes take off from the same terminal?

Mr. ANDREWS. Yes, sir; both originated Los Angeles.

Mr. ROGERS. May I ask one more question, Mr. Andrews.

There was not any question in this situation about there being air congestion produced by too many aircraft in the area, was there?

Mr. ANDREWS. I have no such information. And I would say that that situation did not exist.

Mr. MACDONALD. Mr. Chairman, may I ask a question?

Mr. HARRIS. Yes.

Mr. MACDONALD. If there were no other planes within one-half hour in time of these 2 planes, do you have any idea why these 2 planes would take off within 3 minutes of each other?

Mr. ANDREWS. Yes, sir; because they were scheduled to take off. And it is a regularly scheduled operation being operated by the airlines.

Mr. HINSHAW. That is not quite correct, because one was scheduled to take off at 9:30 and the other one at 9:45, I believe.

Mr. ANDREWS. I see what you mean.

I do not think there is any control from an airport, sir, as to the takeoff, other than the local traffic. And as to the reason, I would like to ask one of our boys as to the reason for the traffic delay, or whatever it was. I don't know, sir.

Mr. HARRIS. We can establish that when we have the other witnesses.

Mr. ANDREWS Yes, sir.

Mr. WILLIAMS. Mr. Chairman?

Mr. HARRIS. Mr. Williams.

Mr. WILLIAMS. Mr. Andrews, you stated that you were still awaiting additional information on the weather based on pilot reports, and apparently you do not have complete information on the exact conditions of the weather. But do you have enough information to determine whether or not these thunderheads were in the process of building or had they already reached full-blown proportion?

Mr. ANDREWS. No, sir. That is what the Weather Bureau and our meteorologist is doing for us at this time.

Mr. WILLIAMS. You do not know, of course, whether the tops were isolated or whether they had developed to the point where they were very numerous and it was necessary for the pilot to work his way in and out among them?

Mr. ANDREWS. I would suspect that was true, sir, but I have no fact to that effect or knowledge as to that at this time.

You must understand, sir, that we branched out all over the country trying to get the information.

Mr. WILLIAMS. I understand. You will get it if you can, of course.

Mr. ANDREWS. Yes, sir.

Mr. WILLIAMS. I was wondering if you had developed enough information at least to form an opinion on whether or not that was the condition.

Mr. ANDREWS. You see, sir, the main thing was to try to get to and examine that wreckage, as well as impound other records and start moving. And it takes a week to 10 days to start getting the information actually in.

However, we are furnished preliminary information, but sometimes it is not correct.

Mr. FLYNT. Mr. Chairman?

Mr. HARRIS. Mr. Flynt.

Mr. FLYNT. Mr. Andrews, I want to question one statement and see if I got your words correctly.

In reply to a question as to why these 2 planes took off within 3 minutes of each other, I wrote down:

There was no control of takeoff time by the control tower.

Mr. ANDREWS. What I meant by the control tower is it regulates traffic around a given airport, and if there is space between those two aircraft, then it is cleared to take off.

Mr. FLYNT. Certainly the control tower must give clearance to any plane taking off.

Mr. ANDREWS. That is correct, sir, provided there is no traffic within the control zone around the airport.

Mr. FLYNT. Now, would you express an opinion as to whether 2 planes generally flying the same course, taking off within 3 minutes of each other, would constitute more than 1 plane in the same area?

Mr. ANDREWS. No, sir; it would not, because we have had it happen every day all the time. We have many flights that leave at peak periods from Chicago for Washington or Washington to Chicago every day.

Mr. FLYNT. Then they are not usually cleared at the same altitude, are they?

Mr. ANDREWS. They are not normally under control, except under IFR conditions. They may be under VFR, in which there is no control or no responsibility for control.

Mr. HALE. I would like you to state for the record what IFR and VFR mean.

Mr. ANDREWS. VFR is visual flight rules; IFR is instrument flight rules.

Mr. WILLIAMS. Mr. Andrews, had both of these planes been cleared IFR, as one of them was—I believe the United plane was—they would have been assigned different altitudes, would they not, in all likelihood?

Mr. ANDREWS. As long as they were in the responsible control zones.

As I understand the picture, and from the statement that you will probably get from the Civil Aeronautics Administration, they were out of the responsible area of control. Actually, the accident occurred in the Albuquerque control area. They went from the California control area, one flight into the Albuquerque, and the other flight, the TWA flight, into the Salt Lake area. And then the United crossed into the Albuquerque area.

Excuse me. I am wrong. I think the accident occurred in the Salt Lake area; wasn't it?

Yes; I am wrong. It occurred in the Salt Lake area.

Mr. WILLIAMS. I have one more question to try to clear my mind on this.

The United plane was cleared direct, I believe, at 21,000 feet; was it not? Was it not given a definite specific altitude, even over the uncontrolled area, at 21,000 feet?

Mr. ANDREWS. That is correct, sir.

Mr. WILLIAMS. Now, had the TWA flight been cleared IFR instead of VFR, a thousand on top, they would have been assigned a definite altitude; would they not?

Mr. ANDREWS. Yes, sir; IFR clearance.

Mr. WILLIAMS. Then, in all probability, the fact that the two planes were flying a more or less parallel route would have required that they be assigned to different altitudes on instruments; is that right?

Mr. ANDREWS. Actually, TWA was refused 21,000.

Mr. HARRIS. By whom?

Mr. ANDREWS. By the CAA.

Mr. HARRIS. Where?

Mr. ANDREWS. At Los Angeles.

Mr. WILLIAMS. They were refused an IFR clearance?

Mr. ANDREWS. They requested first, as I understand the picture, 19,000. There was other traffic there. They requested 21,000, and

because of United on that, they were refused that, but offered a VFR clearance, a thousand feet on top.

Mr. MACDONALD. Which, in effect, was 21,000 feet, under those conditions?

Mr. ANDREWS. It could if he was a thousand feet on top and 2,000 feet from any columns.

Mr. MACDONALD. It may be a little unsophisticated, but if they are refused 21,000 feet for a clearance and yet they are cleared to go 1,000 feet above a cloud formation, which you have said was 20,000 feet, I don't quite see the difference.

Mr. ANDREWS. Well, the problem is that a pilot flies under certain rules which are established. It used to be 500 feet on top and they have raised it to a thousand feet on top not too long ago.

Now, when the flight climbs on top, he may well climb up on instrument control to breaking out on top. Then if he goes a thousand feet on top on that type of clearance, he must stay a thousand feet above.

Mr. MACDONALD. I understand.

Mr. ANDREWS. He may elect 21,000 if that 21,000 is a thousand feet on top. You see, a pilot just does not follow the contours. He usually picks a constant level. And since TWA reported 21,000, a thousand feet on top, his clearance was legal.

Mr. ROGERS. Would the gentleman yield for one question?

Mr. MACDONALD. Yes.

Mr. ROGERS. Mr. Andrews, where you clear them for a thousand feet on top, and that happens to be the same altitude as a plane that is cleared IFR at 21,000, the only safety factor then is the sight of the pilot flying the VFR plane?

Mr. ANDREWS. That is right. And it is a see and be seen policy. The pilot of the TWA had to stay in the clear under that clearance.

Mr. ROGERS. And if he does not look out the window, then there is not much to that safety policy; is there?

Mr. ANDREWS. I will concede that.

Mr. MACDONALD. Is there not another safety factor? When they clear him, would it not be reasonable to tell him, yes, we clear him, but to watch out because in the same area is another plane who had been cleared at 21,000 feet from Los Angeles?

Mr. ANDREWS. As a matter of fact, that happened, sir.

Mr. MACDONALD. Did that happen?

Mr. ANDREWS. Yes, sir. Salt Lake, as I understand it, advised TWA that its traffic was United.

Mr. MOULDER. Mr. Chairman?

Mr. HARRIS. Mr. Moulder.

Mr. MOULDER. The amazing circumstances appears to me to be that at 10:55 TWA reported—at Lake Mohave, was it?

Mr. ANDREWS. Yes, sir.

Mr. MOULDER. Flying at an elevation of 21,000.

Mr. ANDREWS. Correct, sir.

Mr. MOULDER. And United reported at 10:58.

Mr. ANDREWS Three minutes behind it, sir.

Mr. MOULDER. At Needles radio.

Mr. ANDREWS. Yes, sir.

Mr. MOULDER. Flying at the same elevation.

Mr. ANDREWS. Right, sir.

Mr. MOULDER. Only 15 or 20 minutes from the point of intersection. And neither pilot knew of that condition nor of their relative positions in that respect.

Mr. ANDREWS. Other than the advice to TWA that United was traffic for him.

Mr. HALE. That United was what?

Mr. ANDREWS. Traffic.

Mr. WILLIAMS. Under your current CAA regulations, what is the minimum difference that they will allow in altitude levels in clearing planes over the same route at the same time: is it a thousand feet or 500 feet?

Mr. ANDREWS. It is a thousand feet, sir.

Mr. MACDONALD. Just one last question, to go back to an original question that I asked:

Do you happen to know whether, at the time of the apparent collision, one of the planes or either of the planes was on IFR or whether they were both VFR?

Mr. ANDREWS. That cannot be answered, sir. I wish I did know. It is reasonable to assume that if TWA was following its flight plan, it would be in the clear. It is reasonable to assume that if they were in the clouds, United had a perfect right to enter that cloud.

Mr. ROGERS. Would the gentleman yield?

Mr. MACDONALD. I yield.

Mr. ROGERS. Is it not a fact that there is presently available fireproof or fire-resistant equipment that could have been in both those planes that could have recorded the whole transaction?

Mr. ANDREWS. I did not quite understand your question.

Mr. ROGERS. Is it not a fact that there is presently available and under manufacture, equipment that could have been put into both of these planes, or that can be put into planes, that could have recorded this entire situation and be available at this time to determine just exactly what happened?

Mr. ANDREWS. No, sir.

We have developed a flight analyzer which I have been very anxious to get across. But, unfortunately, that does not develop record communications.

Mr. ROGERS. It could be so fixed, though, could it not, under the present manufacture of equipment?

Mr. ANDREWS. I would doubt it, because our main trouble in getting a flight analyzer developed has been that everybody wants to put too much on it and it would become so complicated and heavy that it would not be practical.

Mr. FLYNT. Would you yield to me?

Mr. MACDONALD. I would like to ask one last question.

Mr. HINSHAW. May I interrupt?

It is quite obvious that if the airplane would crash with such an instrument aboard, there would be little left of the instrument to give any accurate recording of what had gone on.

Mr. ANDREWS. That is true, sir.

However, in some cases, by mounting them in the tail we have been able to salvage some of them. In other cases they are destroyed. In this case the wreckage was so terrific and the fire was so terrific that I doubt seriously whether any instrument would have been saved.

Mr. HARRIS. Mr. Macdonald?

Mr. MACDONALD. I would like to ask one question.

When you say you wish you knew, but you don't know, whether either plane was on IFR, why don't we know?

Mr. FLYNT. Would you yield to me before he answers that question? I think I can clear it up with a question I want to ask.

Your distinction between IFR and VFR pertains to clearance only and not actual flying conditions. Is that not true?

Mr. ANDREWS. That is true.

Mr. FLYNT. That answers that.

Mr. MACDONALD. I asked originally and received the answer that the second plane when it left was on IFR. Then it was given permission to go on VFR to 21,000 feet. I then asked, which I never got an answer to—and if I did I did not understand it—did it ever go back on to its original plan?

Mr. ANDREWS. United?

Mr. MACDONALD. Yes, the United plane.

Mr. ANDREWS. It was flying at the time of the accident on an IFR flight plan, under IFR flight plan rules. TWA at the time of the accident was flying VFR, under visual flight rules, reporting previously a thousand feet on top.

Mr. MACDONALD. So at the time of the accident, United presumably was flying IFR?

Mr. ANDREWS. That is correct, sir.

Mr. FLYNT. Just a minute.

Mr. ANDREWS. Not flying; but flying under an IFR clearance.

Mr. MACDONALD. What?

Mr. ANDREWS. You are confused with the clearance and the actual conditions.

Mr. MACDONALD. They took off from Los Angeles IFR.

Mr. ANDREWS. Right.

Mr. MACDONALD. And he called in to go VFR 21,000 feet.

Mr. ANDREWS. No.

Mr. MACDONALD. That is what you said originally.

Mr. FLYNT. No.

Mr. ANDREWS. That is TWA.

You see, the clearance has nothing to do with the actual conditions, except that under IFR weather conditions it is mandatory to have an IFR clearance.

Mr. HARRIS. I think that is pretty well established in the record.

Mr. ROGERS. May I make one statement there, that the whole thing boils down to this: That when a flight that is cleared on IFR changes to VFR, they don't report, do they? I mean, if they are cleared clear through, do they have to get permission to change from IFR to VFR? If the pilot can see, there is no use to him to continue to fly IFR.

Mr. ANDREWS. He may call and change his flight plan.

Mr. ROGERS. But in this case he did not?

Mr. ANDREWS. In this case he did not.

Mr. WILLIAMS. Mr. Andrews, this line of questioning would indicate that the committee takes it for granted that the two planes collided in midair. For the sake of the record, I think perhaps it would be well to ask you if that has been established.

Mr. ANDREWS. I would say this, sir, that preliminary information from examination of the wreckage has indicated the distinct possibility that there was a midair collision.

Mr. WILLIAMS. Is there a distinct probability?

Mr. ANDREWS. I would say that the preliminary investigation does indicate a midair collision.

Mr. MOULDER. Mr. Chairman?

Mr. HARRIS. Mr. Moulder.

Mr. MOULDER. I noticed, or read in the newspapers, a report that from one of the planes a message was heard saying, "We are going——" and then it was abruptly shut off.

Do you have anything on that?

Mr. ANDREWS. Mr. McNamara has that information, and I believe the time that that broadcast was made. He will testify as to that from the official records he has.

Mr. HARRIS. Now, Mr. Andrews, you have just given us your opinion that there was a midair collision.

Mr. ANDREWS. That is correct, sir.

Mr. HARRIS. One plane, United Airlines, took off at 1001.

Mr. FLYNT. TWA at 1001.

Mr. ANDREWS. TWA took off first, sir.

Mr. HARRIS. All right, TWA took off at 1001 and was cleared for VFR.

Mr. ANDREWS. Yes, sir.

Mr. HARRIS. At 1004 United took off, cleared on instruments, IFR.

Mr. ANDREWS. That is correct, sir.

Mr. HARRIS. Who gave the clearance to both planes?

Mr. ANDREWS. That would be CAA control at Los Angeles.

Mr. HARRIS. Is it within the jurisdiction or determination of CAA to give 2 planes clearance, taking off from the same terminal as these 2 planes did, a different system?

Mr. ANDREWS. You see, the pilot files his request for flight. It is either granted to him or it is refused, and an alternate may be offered him.

Mr. HARRIS. In other words, it was the CAA responsibility, then, to approve or disapprove the TWA VFR clearance and the UAL IFR clearance?

Mr. ANDREWS. Yes, sir; both of them. Both of them were accepted by CAA and the pilots were advised. And we have, I believe, the exact language of that if you would like to hear it, sir.

Mr. HARRIS. Yes, we probably would like to do that.

Now, in the clearing of the flight plan, when the planes took off, one of them was faster than the other one. Which one?

Mr. ANDREWS. The DC–7, sir.

Mr. HARRIS. That was the one that took off last?

Mr. ANDREWS. Yes, sir.

Mr. HARRIS. In other words, the faster plane took off after the other one?

Mr. ANDREWS. Yes, sir.

Mr. HARRIS. What is the difference in their speeds?

Mr. ANDREWS. At 21,000 feet, I would estimate—it is purely an estimate on my part—that the TWA plane was possibly making good about 250 knots an hour and the DC–7 was capable of approxi-

mately 300. However, his time of reporting which we plotted is slower than that.

Mr. HARRIS. As the flight progressed, they left the control zone?

Mr. ANDREWS. Yes, sir. They passed from one control zone into an uncontrolled zone and back into a controlled zone.

Mr. FLYNT. But a different control?

Mr. ANDREWS. Yes, sir.

Mr. HARRIS. Who is responsible, or whose responsibility is it for the plane passing from control zones to uncontrolled zones?

Mr. ANDREWS Normally, as the flight progresses, it is passed by information between the control centers of CAA. In other words, Los Angeles would notify Albuquerque as to the flight plan of United.

Mr. HARRIS. And the pilots themselves, do they have any authority on their own to get off the control area?

Mr. ANDREWS Yes. If they would change the flight plan from an IFR to a VRF.

Mr. HARRIS. I know, but they did not do that. We are talking about these planes.

Mr. ANDREWS. I don't quite understand your question, sir.

A pilot has the right to change his flight plan if the weather conditions are such that he might.

Mr. HARRIS. United Airlines did not do that, though, did it?

Mr. ANDREWS. That is correct. He accepted his flight clearance as given and proceeded according to that.

Mr. HARRIS. As far as all information is concerned, he proceeded on until the incident occurred?

Mr. ANDREWS That is right.

Mr. HARRIS. And the other plane did not ask, or did not have to ask, to leave the control area, did it?

Mr. ANDREWS. You see, sir, he was cleared to climb VFR. When he requested his altitude clearance, that was refused him because of other traffic. Therefore, he accepted a clearance of 1,000 feet on top. But he reported at 21,000 over Lake Mohave.

Mr. HARRIS. Were not both of these planes over the great-circle route?

Mr. ANDREWS. I would judge that they were going direct as nearly as they could, sir.

Mr. HARRIS. Going over that route they were out of the control area?

Mr. ANDREWS. They were off of the airways, sir.

Mr. HARRIS. Whose responsibility is to to determine whether or not they were on or off the control area?

Mr. ANDREWS. By the mere route that they filed, it would be obvious, going direct to Kansas City or to Chicago, that it would be off-airway flying.

Mr. HARRIS. And therefore, anyone who had anything to do with it would be put on notice that they were flying off airways?

Mr. ANDREWS. I believe CAA contends or states that their responsibility is for airways, and the airway is a 10-mile zone, many lines drawn across the United States 10 miles wide in which they have established these control zones.

Mr. HARRIS. Is this procedure permitted under certain CAB rules?

Mr. ANDREWS. Yes, sir; I would say that it is.

Mr. HARRIS. Could you identify the rules involved?

Mr. ANDREWS. We have under Civil Air Regulations 40.30, requirements for services and facilities; 40.31 WT routes; 40.32 IF routes outside of control zones and 60.44, cruising altitudes, sections (a) and (b).

Mr. HARRIS. Thank you very much.

Mr. HINSHAW. I think those should be furnished for the record.

Mr. ANDREWS. I would be very glad to.

Mr. HARRIS. If you would do that, we would appreciate it.

(The information referred to follows:)

REQUIREMENTS FOR SERVICES AND FACILITIES

§ 40.30 *Route requirements; demonstration of competence.* The air carrier shall show that it is competent to conduct scheduled operations over any route or route segment between any regular, provisional, or refueling airport and that the facilities and services available are adequate for the type of operation proposed. The Administrator shall not require actual flight over a route or route segment, if the air carrier shows that such flight is not essential to safety. The air carrier may thereafter conduct operations between regular, provisional, or refueling airports on any approved route or routes on which the operational facilities and procedures are substantially similar: *Provided*, That high-altitude operations may be conducted over any route.

§ 40.31 *Width of routes.* A route or route segment shall include the navigable airspace on each side of an approved course or courses, and it shall have a width designated by the Administrator consistent with terrain, available navigational aids, traffic density, and air traffic control procedures: *Provided*, That for high-altitude operations, courses need not be approved, and the width of navigable airspace on each side thereof need not be designated by the Administrator.

§ 40.32 *IFR routes outside of control areas.* IFR routes outside of control areas shall be approved if the air carrier shows that the navigational and communications facilities are adequate for the operations proposed, unless the Administrator finds that because of traffic density an adequate level of safety cannot be insured in a particular area: *Provided*, That for high-altitude operations IFR routes need not be approved.

INSTRUMENT FLIGHT RULES (IFR)

§ 60.40 *Application.* When aircraft are not flown in accordance with the distance-from-cloud and visibility rules prescribed in the visual flight rules, §§ 60.30–60.33, aircraft shall be flown in accordance with the rules prescribed in §§ 60.41–60.49.

§ 60.41 *IFR flight plan.* Prior to takeoff from a point within a control zone or prior to entering a control area or control zone, a flight plan shall be filed with air traffic control. Such flight plan shall contain the following information unless otherwise authorized by air traffic control:

(a) Aircraft identification, and if necessary, radio call sign;

(b) Type of aircraft; or, in the case of a formation flight, the types and number of aircraft involved;

(c) Full name, address, and number of pilot certificate of pilot in command of the aircraft, or of the flight commander if a formation flight is involved;

(d) Point of departure;

(e) Cruising altitude, or altitudes, and the route to be followed;

(f) Point of first intended landing;

(g) Proposed true air speed at cruising altitude;

(h) Radio transmitting and receiving frequencies to be used;

(i) Proposed time of departure;

(j) Estimated elapsed time until arrival over the point of first intended landing;

(k) Alternate airport or airports, in accordance with the requirements of § 60.42;

(l) Amount of fuel on board expressed in hours;

(m) Any other information which the pilot in command of the aircraft, or air traffic control, deems necessary for air traffic control purposes;

(n) For international flights: The number of persons on board.

§ 60.44 *Cruising altitudes.* Aircraft shall be flown at the following cruising altitudes:

(a) *Within control areas and control zones.* At altitudes authorized by air traffic control;

(b) *Elsewhere.* At an altitude appropriate to the magnetic course being flown as follows:

(1) 0° to 89° inclusive, at odd thousands (1,000; 3,000; etc.).

(2) 90° to 179° inclusive, at odd thousands plus 500 (1,500; 3,500; etc.).

(3) 180° to 269° inclusive, at even thousands (2,000; 4,000; etc.).

(4) 270° to 359° inclusive, at even thousands plus 500 (2,500; 4,500; etc.).

NOTE: The above cruising altitudes are not in conflict with those required for flight under VFR rules.

Mr. WILLIAMS. Mr. Chairman?

Mr. HARRIS. Mr. Williams.

Mr. WILLIAMS. Mr. Andrews, as I understood it, you said that the two planes flew the airways for a certain distance to a certain point and then proceeded off the airways on their direct course.

As I recall it, the TWA plane, which was the first to take off, flew one airway which I am under the impression, is more or less an east-west airway. The other went to a point about 30 miles south of the point where TWA turned off.

Mr. ANDREWS. You can get a better idea on this map.

Mr. WILLIAMS. The question that I was leading up to is this: Have you calibrated the actual distance flown by the two respective planes before they reached the point of the collision?

Mr. ANDREWS. No, sir; I have not. Actually, we don't know at this time the actual point.

Mr. WILLIAMS. Had they proceeded according to the way that it is indicated, the faster plane, which was the UAL DC–7, having flown to Needles, which is some 30 miles south of the point where the TWA went direct——

Mr. ANDREWS. Approximately 40, sir.

Mr. WILLIAMS. Yes, sir; 40 miles.

Would have flown a few miles farther than the slower TWA plane, would it not?

Mr. ANDREWS. Yes, sir; I think it is a greater distance.

Mr. MOULDER. Mr. Chairman, one question.

Mr. HARRIS. Mr. Moulder.

Mr. MOULDER. Mr. Andrews, at the points mentioned over Needles and at Lake Mohave, would it have been possible for the pilots to have communicated with one another by radio at that distance?

Mr. ANDREWS. I think that it is possible. It depends upon the frequency that each company has. They have many common frequencies, and I could not say whether TWA and United have a common frequency or not.

Mr. MOULDER. If it were possible, and the authorities and those in charge of planning the flights did know, of course, that they were leaving at approximately the same time and flying at approximately the same elevation, or were about to fly at that elevation, is there any requirement or rule as a safety precaution requiring the pilots to endeavor to communicate with one another by radio as to their relative positions and the elevation they are flying?

Mr. ANDREWS. None that I know of, sir.

Mr. MOULDER. There is none?

Mr. ANDREWS. None that I know of, sir.

Mr. WILLIAMS. Mr. Andrews, did either of these planes have any type of special equipment such as radar or any other equipment that would permit them to detect whether there were obstructions in the air in front of them?

Mr. ANDREWS. I cannot answer that. I have requested that information. I asked Dick Petty, vice president of United, if they had radar on United and he said he could not answer. We have asked for a complete history of the aircraft, both of them, including last overhaul and any maintenance, and so forth.

Mr. WILLIAMS. To what extent would radar be accurate or be effective in pointing out the presence of another aircraft in the same area?

Mr. ANDREWS. It would not be very effective, sir. I believe the industry is quite concerned about trying to develop a proximity warning device. The present airborne radar is only effective for weather.

Mr. WILLIAMS. As I understand it, radar might point out something but you could not tell where it was. Is that it?

Mr. ANDREWS. It depends on the size of the set. I believe since the scope is so small, my personal belief is that the blip would be so small you could not distinguish it.

Mr. HINSHAW. Mr. Andrews, I believe that some carriers require their pilots in flight, who are on instrument flight plans, to fly airways; is that true?

Mr. ANDREWS. Yes, sir; that is true.

Mr. HINSHAW. On the other hand, neither of these carriers has such a requirement. Is that right?

Mr. ANDREWS. That is correct.

Mr. HINSHAW. Is there any requirement of the Board that the pilot flying on instrument flight rules shall fly airways?

Mr. ANDREWS. It is perfectly permissible for these flights to operate according to the Board's rules, as they did.

Mr. HINSHAW. It is permissible for them to operate either on airways or off airways?

Mr. ANDREWS. That is correct, sir.

Mr. HINSHAW. But there is no requirement that pilots under instrument flight rules shall fly airways?

Mr. ANDREWS. None that I know of, sir. I don't know of any. Perhaps Mr. Bakke, who is from the Bureau of Safety Regulations, might answer you more specifically than I.

Mr. HINSHAW. If they had been flying airways under instrument flight rules, then would they have been entirely under control?

Mr. ANDREWS. Yes, sir.

Mr. HINSHAW. I think that is quite important, don't you?

Mr. ANDREWS. Yes, sir.

Mr. HINSHAW. You and I have been together on a lot of these things.

Mr. ANDREWS. And it is surprising the similarity that comes up between accidents, too, sir.

Mr. HINSHAW. That is correct. That is all I have.

Mr. HARRIS. You say that you are satisfied in your own mind that there was a midair collision?

Mr. ANDREWS. From preliminary information that I have, and preliminary examination of parts recovered, I would not hesitate to voice the opinion that there was a midair collision.

Mr. HARRIS. And you say that the collision was, in your opinion, at approximately 21,000 feet?

Mr. ANDREWS. I have every reason to believe that, sir.

Mr. HARRIS. Can you establish the time here?

Mr. ANDREWS. No, sir; we cannot, except from one incompleted message, and that was at 1029½, was it not?

Mr. PARSCHALL. Thirty-one and a half. That was the incompleted message.

Mr. ANDREWS. That wasn't tied in with the collision, but it might be.

Mr. WILLIAMS. That was approximately an hour after takeoff, was it not?

Mr. ANDREWS. Yes, sir; approximately.

Mr. FLYNT. Will you yield at that point?

Mr. HARRIS. Yes.

Mr. FLYNT. Did you not give us information a while ago that at 1058——

Mr. ANDREWS. No; at 1058 was the reported call.

Mr. FLYNT. Just then you said that the interrupted message was 1031. Do you mean 1131 instead of 10?

Mr. ANDREWS. 1131½, I believe you said, Jack.

Mr. PARSCHALL. 1131½. That is the off-the-cuff report I had.

Mr. HINSHAW. You had better make the answers, Mr. Andrews, in order to make it on the record.

Mr. ANDREWS. The incompleted message which was intercepted was at 1131½, according to the information that we have, which might indicate that that was the time the accident occurred.

Mr. HINSHAW. Was the frequency on which that message was received determined to be the frequency of either airline?

Mr. ANDREWS. I cannot answer that, sir.

Mr. HINSHAW. If there was no identification in the message as to which airline pilot was reporting that fact, then you do not know which one was making it.

Mr. ANDREWS. No, sir; that is correct. At this time I don't know.

Mr. HINSHAW. Is there any identification of frequency or channel?

Mr. ANDREWS. We do not have that, sir.

Mr. HINSHAW. Was it on a common frequency of the Civil Aeronautics Administration?

Mr. ANDREWS. May I question my men, sir? I don't have that report yet.

Do you know what frequency that was on, Bill?

Mr. MACNAMARA. No, sir; I do not.

Mr. ANDREWS. Who received the message?

Mr. MACNAMARA. I have no knowledge.

Mr. ANDREWS. You don't know what frequency?

Mr. PARSCHALL. I understand it was overheard by flights 903 and 625 of United Airlines.

Mr. ANDREWS. It must have been United's frequency since it was overheard by United flights.

Mr. HARRIS. Can you give us the name of the station that heard it?

Mr. PARSCHALL. No; I cannot.

Mr. HARRIS. Mr. Andrews, can you give us that?

Mr. ANDREWS. No, sir.

Mr. HARRIS. Can you get that information for us?

Mr. ANDREWS. Yes, sir.

Mr. HARRIS. Would you provide that for our committee?

Mr. FLYNT. Would the chairman yield at that point, Mr. Chairman?

Mr. HARRIS. Yes.

Mr. FLYNT. Did not someone just a minute ago say that it was overheard by flights blank and blank?

Mr. PARSCHALL. That is right.

Mr. ANDREWS. By two United flights.

Mr. FLYNT. Will you supply for the record the numbers of those two United flights?

Mr. PARSCHALL. 903 and 625, is the information I have.

Mr. ANDREWS. 903 and 625, United Air Lines.

Mr. HARRIS. Back to the other question of a moment ago; is there any information that you have from your investigation to determine which side of which plane might have struck the other?

Mr. ANDREWS. No, sir. We merely have indications of paint from one airline on the other on certain portions. We have not analyzed it yet. As a matter of fact, we have not secured from the bottom of the canyon all of the material that we need. And that is going to take us another couple of weeks, perhaps, before we can even begin to analyze all that material.

Mr. HARRIS. I appreciate that you have not had time yet to evaluate that information.

But have you enough information to indicate which portion of the plane might have struck?

Mr. ANDREWS. As to which portion of which aircraft struck the other, I don't know at this time, sir. We have been unable to determine.

Mr. HARRIS. What about the condition of the propellers?

Mr. ANDREWS. The propellers were down on the ground. We haven't been able to get to them at this time.

Mr. MACDONALD. One question, Mr. Chairman.

Mr. HARRIS. Yes.

Mr. MACDONALD. Do you have any idea or any indication of what the weather was at the time of the impact at 11:31 in that area? Was it clear or cloudy or broken or what?

Mr. ANDREWS. As I understand the situation, sir, the weather was ceiling 2,000 feet from the ground, with tops at 20,000 and columns going to 22,000.

Mr. WILLIAMS. Was it completely overcast or broken?

Mr. ANDREWS. I think about nine-tenths, or something like that.

Mr. MACDONALD. It was perfectly clear at 21,000?

Mr. ANDREWS. That is the information we have, except for the buildup of the columns.

Mr. HALE. Mr. Chairman?

Mr. HARRIS. Mr. Hale.

Mr. HALE. As one pilot leaves the airways he is under no control whatsoever and has no safety——

Mr. ANDREWS. He is under no separation control, sir.

Mr. WILLIAMS. Except to honor his clearance; is that not right?

Mr. ANDREWS. That is correct.

Mr. HALE. Except to what?

Mr. WILLIAMS. Honor his clearance, honor the limitations of his clearance.

Mr. HALE. He doesn't know——

Mr. WILLIAMS. Or to conform with his clearance.

Mr. HALE. He has no means of knowing what other planes are flying in that vicinity?

Mr. ANDREWS. Not unless he is advised, sir.

Mr. HALE. Who is there to advise him?

Mr. ANDREWS. If he is under an IFR control and there was other traffic on the airways, then the CAA would advise him of other known traffic. As a matter of fact, they would clear him at a specific altitude and not clear anybody else at that altitude.

Mr. HALE. Would it not be possible to have radar, just the way ships have radar, so that they would know what is in the air in the vicinity.

Mr. ANDREWS. I think our military network, sir, established the fact that we can spot aircraft under certain conditions. As to the extent of the use by civilian aircraft, that is something I imagine somebody else will have to decide.

Mr. WILLIAMS. Mr. Andrews, this is not directly relating to the accident in question, but more to the methods of CAA operations in granting these clearances, in which this committee, of course, is primarily interested. Just to what extent do the various stations maintain liaison with each other to clear aircraft flying in the same uncontrolled area?

For instance, assuming that there had been two flights leaving at approximately the same time for the destination points to which these planes were headed; coming back in this direction, would there have been any liaison between Los Angeles and, say, Kansas City as to the clearance of those two flights?

What method do you have of maintaining liaison between stations like that in order to prevent collisions where one station clears a plane without the knowledge of the other station clearing a plane in the same direction?

Mr. ANDREWS. That, sir, is the responsibility of the Civil Aeronautics Administration.

Mr. WILLIAMS. I know that.

Mr. ANDREWS. And I would a whole lot rather for them to answer their own questions as to how they maintain liaison between two places.

Mr. WILLIAMS. I am sorry. I will defer that.

Mr. ANDREWS. Thank you.

Mr. HARRIS. Just one final question, Mr. Andrews. Will you describe the cockpit visibility of the two aircraft as far as the pilots are concerned?

Mr. ANDREWS. We are getting visibility charts at this time from our technical division, and they are shooting the angles, and they have not finished that yet for me, so I cannot answer that. I can furnish what information we have to the committee. We are getting it for our hearing which the Civil Aeronautics Board will hold, and it will become a matter of public record.

Mr. WILLIAMS. There is less visibility, as a practical matter, in the Constellation than in the DC–7, is there not?

Mr. ANDREWS. My personal opinion is that there is.

Mr. HARRIS. You can describe that for the record later.

Mr. ANDREWS. I can furnish you the visibility charts for both aircraft if you would like to have it.

Mr. ROGERS. May I ask a question, Mr. Chairman?

Mr. HARRIS. Yes.

Mr. ROGERS. You said in your testimony just a moment ago that if a flight is cleared IFR at a certain altitude, no other flight is cleared at that altitude.

Mr. WILLIAMS. From the same station.

Mr. ROGERS. I understand. But is that not exactly what happened in this particular situation, even though the other flight was cleared at that altitude under a different set of rules?

Mr. ANDREWS. Well, I would not say that each flight was flying under the same clearance. UAL was flying under an IFR type of clearance, protected airways IFR conditions only. TWA was flying under visual flight rules, and it was the responsibility of the TWA pilot to maintain his own separation under this type of clearance.

Mr. ROGERS. Well, regardless of who the responsibility falls on, it seems to me that we are interested here in the lives of people, and no matter what rules they are cleared under, if they are cleared under IFR at 21,000 feet and the other is cleared under VFR 21,000 feet, a collision would not be avoided, as it was not in this case simply because one planes flies VFR and the other IFR.

Mr. ANDREWS. That is correct. But I am trying to refer only to the types of clearances.

Mr. ROGERS. I understand that. But what I am speaking of is this, Mr. Andrews, that if there is such a situation existing, it should have been cleared up some time ago and ought to be cleared up as quickly as possible now, it seems to me.

Mr. HALE. What was the distance from Los Angeles to the point of collision, approximately?

Mr. ANDREWS. Have you measured that, Bill?

Mr. HALE. That is, by the paths flown by the respective aircraft.

Mr. ANDREWS. For TWA we have to calculate it was 365 miles and for UAL it was 372 miles.

Mr. WILLIAMS. Part of that time both ships were climbing; were they not?

Mr. ANDREWS. Yes, sir.

Mr. WILLIAMS. And their speeds might have been variable when climbing?

Mr. ANDREWS. That is right.

Not only that, but the DC–7 might have been heavily loaded, which slowed it up considerably also.

Mr. ROGERS. It was called to my attention a second ago that there were two different sources that gave clearance to these planes. That is, the change in the altitude clearance to the TWA plane was made by a different source, or a different station of CAA than the original clearance given to it. That would not be true, would it? Because they would have to go back to the original source to find out where he was cleared.

Mr. HARRIS. I might say, if the gentleman will permit, we are going to have people here who actually gave the clearances of all aircraft. We can get to them.

Mr. ROGERS. Thank you.

Mr. FLYNT. Mr. Chairman?

Mr. HARRIS. Mr. Flynt.

Mr. FLYNT. In line with that, just for the record, a while ago did I understand you correctly to say that both of these planes were cleared by CAA?

Mr. ANDREWS. That is right.

Mr. FLYNT. If so, would it not be a little more definitive statement to say that they were cleared by Los Angeles Airways Traffic Control?

Mr. ANDREWS. That is entirely correct, sir.

Mr. HARRIS. Thank you very much, Mr. Andrews.

Mr. ANDREWS. Thank you, sir.

Mr. HARRIS. Mr. William S. MacNamara.

Mr. MacNamara, you may be seated. I believe your position is an investigator with the Bureau of Safety Investigation of the Civil Aeronautics Board?

STATEMENT OF WILLIAM S. MacNAMARA, INVESTIGATOR, BUREAU OF SAFETY INVESTIGATION, OPERATIONS GROUP, CIVIL AERONAUTICS BOARD

Mr. MACNAMARA. That is correct.

Mr. HARRIS. Traffic control?

Mr. MACNAMARA. My position is a flight operations specialist.

Mr. WILLIAMS. What section?

Mr. MACNAMARA. Investigation Division.

Mr. HARRIS. It may be, Mr. MacNamara, in view of the questions that have been asked by various members of the committee, and many of them have already been referred to you, that you might be able to clear up some of them.

Mr. MACNAMARA. I will try my best, sir.

Mr. HARRIS. Very well, you may proceed.

Mr. WILLIAMS. In order to identify Mr. MacNamara's responsibility a bit more clearly, would you distinguish between your duties and those of Mr. Andrews' section?

Mr. MACNAMARA. Mr. Andrews is Director of the Bureau of Safety Investigation, and the Bureau of Safety Investigation has a division which is an investigation division and I am a member of the Investigation Division. We do the physical investigation of aircraft accidents.

Mr. HARRIS. In the Civil Aeronautics Board?

Mr. MACNAMARA. Yes, sir.

Mr. WILLIAMS. Then you are an accident investigator?

Mr. MACNAMARA. Yes, sir.

Mr. WILLIAMS. For the CAB.

Mr. HARRIS. And you have been active on this particular investigation; is that true?

Mr. MACNAMARA. That is correct, sir.

Mr. HARRIS. Very well, you may proceed.

Mr. MACNAMARA. Where would you like to have me start off, sir?

Mr. HARRIS. I think perhaps it would be advisable for you to start with the first information you had regarding this incident, and what action you took and what factual information you have obtained that you might be able to impart to us.

Mr. MACNAMARA. I was advised of this accident, or the possibility of this accident, on June 30, Saturday afternoon at approximately 4:30 in the afternoon.

Mr. HARRIS. Where were you?

Mr. MACNAMARA. I was at my home in Washington, D. C.

Mr. WILLIAMS. That was during the period of time the planes were overdue and before they were discovered?

Mr. MACNAMARA. That is correct.

I made various calls to the director to the CAB investigator in charge, Kansas City, the CAB investigator in charge, Santa Monica, Calif., and the CAA Communication Center, trying to obtain more information and coordinate the investigation.

When it was determined that the aircraft were overdue, Mr. Andrews directed certain of our personnel to assemble in Winslow, Ariz. They were to stand by in Winslow until the aircraft wreckages possibly were discovered.

My position was maintaining liaison in Washington until Tuesday morning Mr. Andrews directed that I proceed to Los Angeles, Calif., to assist in the operational phases of the accident.

I arrived in Los Angeles Tuesday evening at approximately 8 o'clock and I was met the next day by Mr. Markey. I was advised by Mr. Andrews that Mr. Mitchell would be in charge of the operating group to investigate the operational phases and I was to serve on this group. Since that time, I have been appointed in charge of dispatch, traffic control, and all communications.

We had a meeting yesterday in Los Angeles at which the CAA, the company personnel, and CAB were all represented. At that time, various requests were made to the CAA and to the various airlines for certain exhibits. These exhibits have not, of course, been received. However, they are being compiled and we will receive these copies as soon as possible, which we anticipate will be the first part of the week.

Mr. HARRIS. What do they consist of?

Mr. MACNAMARA. They consist mainly of all communications records, all flight plans, all dispatch releases, weight manifests, and copies of any information, any communications to or from the aircraft or communications——

Mr. HARRIS. Tape recordings?

Mr. MACNAMARA. The only tape recordings so far that we have received have been the tape recordings of the Los Angeles ARTC, Albuquerque ARTC, and Salt Lake City ARTC.

Mr. FLYNT. What is that last? ARTC or Air TC?

Mr. MACNAMARA. ARTC. That is routing.

Mr. HARRIS. These records have been impounded?

Mr. MACNAMARA. Yes, sir.

Mr. HARRIS. And where are they?

Mr. MACNAMARA. They are in Los Angeles, Calif., in the office of the Civil Aeronautics Board.

These various documents were requested from CAA and, as I said, the various airlines. At this time, of course, I do not have copies of them. However, CAA has provided us with a transcript of the recorded conversation, one-way conversation, with Salt Lake City ARTC, Albuquerque ARTC, and Los Angeles ARTC and Los Angeles control tower.

Mr. HINSHAW. You say one-way recording?

Mr. MACNAMARA. Yes, sir.

Mr. HINSHAW. Where is the other way?

Mr. MacNamara. There is just a one-way record that records contacts made by the operator on duty at the control center.

Mr. Hinshaw. There is no recording of the incoming communication?

Mr. MacNamara. No, sir; not to my knowledge.

Mr. Harris. Do you have the recording with you?

Mr. MacNamara. No, sir; I have a transcript of it.

Mr. Harris. You have a transcript of it?

Mr. MacNamara. Yes.

Mr. Harris. With you?

Mr. MacNamara. Yes, sir.

Mr. Harris. Could you let us have it?

Mr. MacNamara. I certainly could, sir.

If you would like to have me do so, I can go over this flight from the information that I have. Bear in mind this is not complete.

Mr. Harris. I wonder if, since we are talking about that, it would not be appropriate to read that into the record at this point.

Mr. MacNamara. Yes, sir.

Mr. Harris. Identify each one of them.

May I inquire, is there anything in these recorded records that should not be received in a public hearing such as this? We are going into executive session in a few minutes. That is the reason I asked you if there is anything of a confidential nature.

Mr. MacNamara. I could summarize this for you and give you my interpretation of these various things.

Mr. Harris. I think we would probably rather have the actual recordings, if you will give them to us, when we get into executive session.

Mr. Flynt. I would rather have it in executive session, Mr. Chairman.

Mr. MacNamara. Fine.

Mr. Harris. Is that what you prefer to do under the circumstances?

Mr. Durfee. Mr. Chairman, under the circumstances, in view of the fact that this record has been impounded by an order of the responsible officer in charge, and in view of the fact that we have not had an opportunity to evaluate this information as to whether or not it should be made a matter of public record, we would prefer, at least for the immediate purpose of the examination of this record by this committee, that it be divulged by the witness in executive session, at least at this time.

Mr. Harris. That is the reason I wanted to establish the advisability of it, Mr. Chairman.

Mr. Durfee. We have not had an opportunity ourselves.

Mr. Harris. We will receive it later, then, when we get in executive session.

Mr. MacNamara. Would you like to have me go over the flight and the information that I have?

Mr. Harris. Yes, if you will.

Mr. MacNamara. Regarding clearances.

TWA's flight was cleared to the Kansas City Airport. They received an IFR clearance to Kansas City. They were to maintain 19,000 feet.

Mr. Hinshaw. Wait just a minute.

Please state the airways which they were following as green 5 or whatever it was, and describe what those airways were.

Mr. MACNAMARA. Yes, sir.

To maintain 19,000 feet, via green 5, amber 2, to Daggett, direct Trinidad.

Mr. HINSHAW. I think you had better spell that out a little bit for our record.

You say green 5, amber 2, direct.

Green 5 is an airway, amber 2 is an airway, and direct means off the airways; is that correct.

Mr. MACNAMARA. That means that green 5 is an airway, and they proceed out green 5——

Mr. HINSHAW. Where is that airway? Will you name the town?

Mr. MACNAMARA. That airway is due east out of Los Angeles.

Mr. HINSHAW. Will you name the termini of that airway and the portion of it which was followed by this particular aircraft?

Mr. MACNAMARA. Green 5 to the amber 2 intersection is approximately 25 miles east of Los Angeles. Now, this was the original clearance.

Mr. WILLIAMS. He traveled out green 5 to the intersection, to where amber intersects with green?

Mr. MACNAMARA. Where green 5 intersects with amber 2. This was the initial clearance. However, this was later revised.

Mr. HINSHAW. You have not said anything about where the amber 2 intersection is.

Mr. MACNAMARA. Amber 2 intersects green 5 approximately 20 miles east of Los Angeles.

Mr. HINSHAW. What is the name of the city, town, or village which would identify that point?

Mr. MACNAMARA. I don't have it on this chart, sir.

Mr. HINSHAW. It is on the chart which you have available. Would you have it read?

Mr. MACNAMARA. That is in the vicinity of Ontario, Calif.

Mr. HINSHAW. At what point did he change the clearance?

Mr. FLYNT. Wait just a minute.

Mr. HARRIS. He is not on amber 2 yet. You get to the amber 2 next after you leave green 5?

Mr. MACNAMARA. To proceed up amber 2 to Daggett. From Daggett the flight was cleared direct to Trinidad. That direct clearance routed the aircraft off the civil airways.

Mr. WILLIAMS. It left the civil airways at Daggett?

Mr. MACNAMARA. Yes, sir.

Mr. WILLIAMS. I mean the clearance proposed it?

Mr. MACNAMARA. Yes; the original clearance proposed it; that is correct.

However, when the TWA flight was out on the runway at Los Angeles, he requested a change in his departure to depart via Victor Airway 210. Victor Airway 210 is approximately a straight line from Los Angeles to Daggett. That is a VOR airway.

Mr. HINSHAW. VOR meaning visual omnirange.

Mr. FLYNT. Is that a 90-degree bearing?

Mr. MACNAMARA. That is 210 degrees from Daggett, and approximately, from the looks on this chart, 45 degrees out of Los Angeles.

Mr. HINSHAW. I believe it shows 64 degrees; does it not?

Mr. MacNamara. That could be correct.

Mr. Harris. We are anxious to get all the information we can and I wish you would proceed to get the continuity of the story as to how they were cleared and what they were changed to and what happened.

Mr. MacNamara. TWA's flight, as I said, was on an IFR clearance, They were cleared to depart under VFR conditions, and Los Angeles radar gave TWA a steer-to on top. In other words, they were an assist for the flight to avoid other aircraft on their climb out of Los Angeles.

The aircraft, when he was on top of whatever the local conditions were, smog or what have you—I don't know the altitudes—reported as being on top and he proceeded on to Daggett.

Mr. Williams. He did not give the altitude at which he broke out?

Mr. MacNamara. No, sir; he reported as on top and that is all.

United's clearance, from the information that I have——

Mr. Harris. You have got him to Daggett. Do you want to wait and catch him again when you get United that far?

Mr. MacNamara. Would you like to have me give his estimated times?

Mr. Harris. I think that would be advisable.

Mr. MacNamara. TWA departed Los Angeles off the ground—I will give you all the times in mountain standard and there won't be any confusion.

They were cleared off the ground at 1001. They estimated Daggett at 1035. They reported over Daggett at 1034 at 20,000 feet, climbing to 1,000 on top. They estimated Lake Mohave at 1055. They reported over Lake Mohave at 1055 as 1,000 feet on top at 21,000 feet.

They were estimating Painted Desert at 1131.

Mr. Hinshaw. Would you again confirm the fact that Painted Desert is not a point on a map, but a line on a map a hundred or so miles long?

Mr. MacNamara. That is correct; it is a line of position.

Mr. Hinshaw. It is a line of position and not a point?

Mr. MacNamara. That is correct.

Mr. Hinshaw. We are ordinarily of the understanding that Painted Desert is a place.

Mr. Flynt. No; it is a line.

Mr. Hinshaw. But in this case it is a line how long? Let's see if we can measure it here.

About 150 miles, I would guess, or 100, or something like that.

So that when we say Painted Desert reporting point, in statute miles it is 100 miles. Is that right?

Mr. MacNamara. Approximately that, sir. I have not rechecked the measurements on it.

Mr. Williams. What was that ETA again; Painted Desert?

Mr. MacNamara. 1131.

Mr. Hinshaw. So that to a pilot giving an estimated time at Painted Desert, would you call it an intersection or a position reporting point, or what?

Mr. MacNamara. It is line of position.

Mr. Hinshaw. A line of position. That could mean anywhere on that line, could it not, off airways?

Mr. MacNamara. That is correct, where his course crossed it going direct to Trinidad.

Mr. FLYNT. May I interrupt at that point? I hate to, but I think it is important or I would not do it.

Mr. HARRIS. Yes.

Mr. FLYNT. A while ago we were told that the takeoff time was 1001 Pacific daylight time. You just said it was 1001 mountain standard time, which is 2 hours difference.

Mr. HINSHAW. That is the same time.

Mr. FLYNT. Mountain standard and Pacific daylight are the same thing?

Mr. HINSHAW. Yes.

Mr. MACNAMARA. All the information I have given you has not been verified.

Mr. HARRIS. It has not been verified?

Mr. MACNAMARA. It has not been verified according to the times. I have not compared these transcripts with the original tapes.

Mr. HARRIS. All right.

Mr. MACNAMARA. I have not had an opportunty.

United Air Lines flight 718 was cleared to Chicago Airport on an IFR flight plan to maintain 21,000 feet, via Green 5, that is, a civil airway out of Los Angeles, to Palm Springs. And they were further cleared Palm Springs to Needles——

Mr. WILLIAMS. Along Green 5?

Mr. MACNAMARA. That was a direct course, off airways.

Mr. WILLIAMS. To Needles?

Mr. MACNAMARA. To Needles. And further cleared from Needles via flight plan route. In other words, the flight plan route is the flight plan that the captain filed prior to his departure.

In other words, what he wanted was approved pertaining to his routing.

Mr. HINSHAW. That is Chicago direct out of Needles?

Mr. MACNAMARA. Out of Needles to Trinidad direct. He was to climb——

Mr. HINSHAW. Were they both planning to go to Trinidad first?

Mr. MACNAMARA. I am sorry, I made a mistake on that. He was further cleared from Needles to Durango.

Mr. WILLIAMS. And from there to Chicago?

Mr. MACNAMARA. Yes, sir.

Mr. HALE. That is Colorado?

Mr. MACNAMARA. Yes, sir.

United flight 718 was cleared to climb out of Los Angeles under VFR conditions. They, like TWA, received radar vectoring to on top and they reported as on top to radar and they proceeded themselves to 21,000.

United Air Lines flight 718 was off Los Angeles at 1004, and that again is mountain standard. We have no estimate on their Palm Springs position. However, they did report at Palm Springs at 1037 and they reported as 18,000, climbing. They were estimating Needles at 1057, and we also have a second position report, or an estimate on Needles, of 1100. That would be 11 o'clock.

They actually reported over Needles at 1058, at 21,000. They were estimating Painted Desert at 1131.

Mr. HARRIS. How far is it from Los Angeles to Needles?

Mr. MACNAMARA. Los Angeles to Needles along the flight planned route is approximately 204 miles.

Mr. HARRIS. May I ask this:

How far is it, according to the flight plan, between the flight plan routes of the two planes at Painted Desert?

Mr. MACNAMARA. According to my chart and my figures, at Painted Desert the lines of position would be approximately 6 to 8 miles apart.

Mr. HARRIS. Six to eight?

Mr. MACNAMARA. According to my figures.

Mr. HALE. Six to eight, or sixty-eight?

Mr. MACNAMARA. Six or eight miles apart.

Mr. HARRIS. In other words, both of them reported over Painted Desert at the same time?

Mr. MACNAMARA. No, sir; there were no position reports made over Painted Desert. They estimated.

(Discussion off the record.)

Mr. HARRIS. Thank you very much, Mr. MacNamara. If you will make yourself available a little later on for this other information, we will call you back.

Mr. MACNAMARA. Thank you, sir.

Mr. HARRIS. Before we recess for the noon hour, because after we come back after lunch we are going into executive session, I might state for the benefit of those who are interested we will have the people from the Los Angeles tower who had something to do with the departure clearance and control of both UAL and TWA, and also the Los Angeles center people with reference to clearances and from the Salt Lake center and the Needles station.

Then we will have some witnesses who have come over from the Grand Canyon.

However, at this time, before we adjourn, I want to ask Mr. James Pyle if there is anything he wants to present.

Mr. PYLE. Mr. Chairman, Mr. Garrison should give the information for the record of the committee.

STATEMENT OF JOHN A. GARRISON, CHIEF, FACILITIES OPERATIONS BRANCH, FOURTH REGIONAL OFFICE, LOS ANGELES, CALIF., CIVIL AERONAUTICS ADMINISTRATION

Mr. HARRIS. Mr. Garrison, your name is John Garrison, is it not?

Mr. GARRISON. Yes, sir.

Mr. HARRIS. You are the Chief of the Airways Operations Division of the Civil Aeronautics Administration?

Mr. GARRISON. No, sir; I am not the Chief of the Division. I am the Chief of the Facilities Operations Branch under the Division Chief.

Mr. HARRIS. CAA?

Mr. GARRISON. CAA Fourth Regional Office, Los Angeles.

Mr. HARRIS. All right. We wanted to get you identified for the record.

I understood that you wanted to give information regarding the responsibility and procedure in clearances.

Mr. GARRISON. Yes, sir.

Mr. Chairman, if I might, I would like briefly to again, just for continuity's sake, run through the flights from departure very briefly up toward the scene of the Painted Desert, if I might.

Mr. HARRIS. We would be glad to have it from you so we can have it in the record. We will just let you proceed without any interruption so that you can conclude your statement.

Mr. WILLIAMS. Is your information of the relative paths flown by the two aircraft and the estimated times of arrival at the various points and the times reported over the various points identical to that of the preceding witness?

Mr. GARRISON. Sir, to the best of my remembrance, yes, with one exception.

I believe he stated that prior to leaving the runway at Los Angeles, TWA requested a change of flight plan from Green 5 and Amber 2 to Daggett, to Victor 210 to Daggett.

Is that a correct statement on my part?

Mr. MCNAMARA. That is right.

Mr. GARRISON. The gentleman confirms it here.

I would like to change for the record the fact that this request by the TWA pilot, according to our records, was made after he had departed, after he had reached on top of the stratus condition in the Los Angeles metropolitan area, and after he had changed from our frequency to the Los Angeles air route traffic control frequency for direct radio communication between himself and the controller in the Los Angeles center. That is the difference that I understand.

Mr. HARRIS. Very well.

Mr. HINSHAW. Of what significance is that?

Mr. WILLIAMS. I don't think there is any.

Mr. HINSHAW. Does that have any significance in this investigation?

Mr. GARRISON. That I cannot say. I do not know. I would see no difference in it, no, except to clarify the record, sir.

Mr. Chairman, I understand that for brevity's sake you would rather not go through the whole flight procedure again. Is that correct?

Mr. HARRIS. If that is the only difference in the description that we have already heard, I see no reason to take the time to go through it again.

Mr. GARRISON. Then, sir, may I give a little background structure of air route traffic control, its purpose, its responsibility, with respect to our airways versus off airways, and just a little bit more on the radar departure procedures in the Los Angeles control tower.

Mr. HARRIS. Very well.

Mr. GARRISON. We have in the United States 26 airways which we call air route traffic control areas.

Mr. GARRISON. The common layman language is airways traffic control. In each of these 26 areas, we have an air route traffic control center which exercises positive air traffic control in designated controlled airspace within their total area.

This center is staffed by a staff of personnel who work aircraft directly, in some cases indirectly through company radio, or CAA communications in other cases.

The responsibility of the individual in these air route traffic control centers, as I said before, lies entirely within the airways structure within his control area. He does not have any responsibility or juris-

diction over flights in uncontrolled airspace. In his particular center's area, which is outside of the 10-mile wide airway structures, we provide what we call flight assistance of flight information service to a pilot.

If I may from there go back into the passing of the flight information from one area to another, which I believe is a point in question, before a flight departs from Los Angeles, for example, a flight plan or a proposed intended flight path, with designated fixes or airways or combinations, is forwarded from the particular aircraft operator to the center in whose area the flight will depart.

Mr. HINSHAW. By aircraft operator, do you mean the carrier itself?

Mr. GARRISON. Carriers, or, in the case of the military, a military flight service center or operations base.

Mr. HINSHAW. Or private?

Mr. GARRISON. Or private.

Overall, as a flight progresses from the Los Angeles control area toward Chicago, if the proposed flight would lead through the Salt Lake control area, the Los Angeles control center will forward information to the adjacent center, which in this case might be Salt Lake, so that Salt Lake may, at the division between the two areas, assume the responsibility for that flight as it enter his area. In turn, Salt Lake will proceed to give information to the Denver center, or the adjacent area.

And that is the manner in which our flight information on instrument flight plans, or aircraft flying under instrument flight plans, is passed from one control area to the adjacent area straight across the United States, for example.

Mr. HINSHAW. Is that by radio or teletype?

Mr. GARRISON. That is via what we call our service air system, which is a private telephone net between our centers.

Mr. WILLIAMS. One question, Mr. Garrison.

Mr. GARRISON. Yes, sir.

Mr. WILLIAMS. These various control areas blanket the United States with the exception of a few pockets, is that correct? Or are they scattered over the United States?

Mr. GARRISON. As far as the percentage of geography covered, sir, I have no answer. There are many places where considerable mileage exists between these areas.

Mr. WILLIAMS. Generally, though, the country is pretty well covered?

Mr. GARRISON. Pretty well. The best comparison we can make, sir, is that we have a system of airways blanketing the United States very much similar to our system of public highways. That would be a comparison.

Mr. WILLIAMS. The area off the airways is considered the uncontrolled area?

Mr. GARRISON. That is correct, sir.

Mr. WILLIAMS. I see.

Mr. GARRISON. In respect to the two flights in question, the two companies filed their proposed flight plans with the Los Angeles Air Route Traffic Control Center, as previously stated. At the time the aircraft taxied out at the Los Angeles International Airport, the pilot contacted the airport traffic control tower and informed him that he was ready to proceed.

The control tower in turn issued instructions for the flight to depart westbound——

Mr. WILLIAMS. Eastbound?

Mr. GARRISON. They depart westbound off of the airport. They leave the runway westbound. Over the shoreline we have what we call a Del Ray marker.

As soon as the flight left the runway, the aircraft changed to Los Angeles radar departure control, which is a function of the Los Angeles tower, or associated with it.

The aircraft, after passing the shoreline or Del Ray, was vectored to a heading of 160° while he was climbing through the cloud layer for approximately 5 miles, at which time the aircraft was vectored to a heading of 070° until reaching on top of the overcast. Both flights were identical to that point, United Air Lines departing 3 minutes behind TWA.

If I recall, United reported on top of the cloud condition at 2,900 feet. TWA reported on top without reference to a specific altitude, if my memory is right.

From the positions on top, the two aircraft were instructed by radar to contact the Los Angeles Air Route Traffic Control Center frequency via radio between the pilot and the controller for their in-route clearances, that is, from their point on top to their proposed destination.

TWA was issued a clearance in accordance with the flight plan he had filed, with the specification that during his flying from on top of the stratus condition over Los Angeles metropolitan area he would proceed to 19,000 feet in accordance with visual flight rules. Basic visual flight rules generally mean that a flight would maintain at least 3 miles forward visibility and would remain clear of clouds. That is a general statement, sir, and not the technical explanation.

Immediately upon acknowledging that clearance, the TWA pilot requested that he change his flight path from Los Angeles to Daggett from his proposed green 5, amber 2 route to a direct route as previously stated by CAB via Victor Airway 210. That was immediately approved.

Approximately 4 minutes before reaching Daggett, TWA ground radio station asked the Los Angeles Center for permission for its flight to climb to 21,000 feet. The flight, after leaving Daggett, would have proceeded for a short time into uncontrolled airspace in the Los Angeles area, then entering the Salt Lake area in uncontrolled airspace, crossing a 10-mile airway, Victor 135 at Lake Mohave, crossing blue 67 a little further east, and subsequently crossing red airway 15 still further east, and thereafter proceeding in uncontrolled airspace until in the vicinity of Trinidad, Colo.

Now, sir, I would like at that moment to bring United Air Lines into the picture.

As previously stated, United Air Lines departure was almost identical with that of TWA to the point of reaching on top over Los Angeles at 2,900 feet, at which time United Air Lines was instructed by Los Angeles radar control to contact the Los Angeles Air Route Traffic Control Center for his en route clearance.

The controller gave United a clearance, approving his flight plan as previously submitted, with an altitude of 21,000 feet specified.

Back to TWA at approximately 9:30, when the TWA Co. requested Los Angeles control for a change of altitude for TWA from 19,000 to 21,000. Since, as previously stated, the TWA flight would shortly enter the Salt Lake control area, it is the responsibility of the Los Angeles controller to coordinate with the adjacent center into which a flight will shortly proceed, to coordinate that proposed change with Salt Lake, and to obtain their concurrence before approving the altitude of 21,000.

That is required specifically, due to the fact that in the vicinity of Lake Mohave, and the three airways just recently referred to, which must be crossed by United Air Lines while in the Salt Lake Air Route Traffic Control area, the controller in Los Angeles could not, of his own, approve the altitude of 21,000 because he had no jurisdiction over the control area into which the flight would proceed shortly after Daggett.

That is the requirement that the controller must meet.

At the time of coordination with Salt Lake, our controller, knowing of United Air Lines proposed flight through an area somewhere east at 21,000, discussed with Salt Lake that fact.

Mr. HARRIS. Who did?

Mr. GARRISON. The Los Angeles controller discussed with the Salt Lake controller in their coordination.

Mr. HALE. That is by mutual teletypes?

Mr. GARRISON. No, sir; that is by, as I previously said, sir, the service F which we call our private-line telephone system.

It was mutually agreed between the Salt Lake and the Los Angeles controllers that it would not be practicable at the moment to assign 21,000 to TWA, or I should say to approve it, because of that possible conflict somewhere east. They advised TWA ground station of that fact and informed it that they would not be able to approve the pilot's request for 21,000, and informed them of the reason why, which was United's proposed flight pattern or flight path through that area east.

Mr. HARRIS. Where was the TWA ground station?

Mr. GARRISON. Los Angeles, Calif.

TWA, very shortly, or almost immediately, then asked our Los Angeles control center if TWA could change his flight plan to an altitude of at least 1,000 feet on top.

Mr. HINSHAW. Did he ask it or did you suggest it?

Mr. GARRISON. He asked it.

This was mutually acceptable between Salt Lake and Los Angeles control centers and the flight was approved for at least 1,000 on top.

Mr. ROGERS. Do you know what on top was at that time?

Mr. GARRISON. I do not, sir.

Mr. ROGERS. Did any one of these dispatchers?

Mr. GARRISON. That I cannot answer.

Mr. ROGERS. Thank you, sir.

Mr. GARRISON. In this exchange just prior to approving the 1,000 on top, however, our controller in Los Angeles did ask of TWA if, from the present position and altitude, the pilot could conduct his flight in accordance with visual flight rules to 21,000 feet.

The pilot replied that he was in such a condition that he could comply.

Mr. HARRIS. Restate that. I want that very definitely because it is important.

Mr. GARRISON. Shall I go back?

Just before final approval of this 1,000 on top, the Los Angeles controller asked TWA to verify from the pilot if, from its present altitude and position, the flight could go or climb to 21,000 in accordance with visual flight rules.

The pilot concurring that he could, a thousand on top was approved.

As I previously stated, I believe, and if not I will state for the record, both TWA and United in their original instructions were cleared from on top over Los Angeles to 19,000 and 21,000 feet, respectively, to make that climb in accordance with visual flight rules.

Mr. ROGERS. What time was that authority given?

Mr. GARRISON. That was at the time just after they were on top over Los Angeles and had changed to the frequency of the Los Angeles control center.

And I do not have, sir; at my fingertips that exact time.

May I ask if any Los Angeles people can supply it?

Mr. HARRIS. May I ask you this question——

Mr. GARRISON. Yes, sir.

Mr. HARRIS. I do not want to interrupt your description here.

Mr. GARRISON. Yes, sir.

Mr. HARRIS. But it is important.

You repeated what was asked of TWA, that is, if they could proceed with—what did you call it? Visual-flight rules?

Mr. GARRISON. Visual-flight rules.

Mr. HARRIS. "Visual-flight rules." That is the term?

Mr. GARRISON. Yes, sir.

Mr. HARRIS. Could you state briefly what are visual-flight rules?

Mr. GARRISON. I will state, sir, if I may, the generally accepted definition of basic VFR flight rules, as I understand it.

Basic VFR flight rules require that an aircraft flying under such conditions have at least a visibility of 3 miles, and that flight on top of an overcast be maintained with at least a 1,000-foot clearance, and that aircraft proceeding through a hole in a cloud, shall we say, maintain a distance of 2,000 feet horizontally to any cloud formation.

That is, I believe, an acceptable statement of basic VFR.

Mr. HALE. Mr. Chairman, may I ask a question?

Mr. HARRIS. Yes.

Mr. HALE. When you give a pilot leave to go a thousand feet on top, the theory is that when he is on top like that he is in a position of relative security. Is that right?

Mr. GARRISON. What do you mean, security, sir?

Mr. HALE. Obviously, when you say a thousand feet on top you don't know how high that may be above the ground. The idea is that if he is on top he can see and he does not need artificial security from a control tower.

Mr. GARRISON. To answer you generally, sir; yes, sir.

I would like to come back to that 1,000 on top later, if I may.

Mr. HALE. I wish you would.

Mr. GARRISON. Thank you, sir.

May I proceed?

Mr. HARRIS. Yes, you may proceed, Mr. Garrison.

Mr. GARRISON. All right.

The flight of TWA subsequently reported over Daggett, Calif., at 9:34. The timess I am using are Pacific standard times.

Mr. HINSHAW. Can you get them all on mountain time. Everything is mountain time, so you might as well use it.

Mr. GARRISON. Mountain time.

Mr. HINSHAW. 10:34, in other words?

Mr. GARRISON. Converting that, it would be 10:34 mountain standard time.

Subsequently reporting over Lake Mohave at 10:55 mountain standard time, estimating Painted Desert at 11:31 mountain standard time.

The altitude reported over Daggett was climbing to 21,000 feet, and at 20,000 feet, if I recall. I believe I am correct in that, at 20,000 feet, climbing to 21,000 feet.

Mr. ROGERS. That is the TWA plane?

Mr. GARRISON. That is TWA, over Lake Mohave at 10:55, mountain time, reporting at 21,000 feet, at least 1,000 on top, estimated Painted Desert at 11:31 mountain standard time.

United Air Lines, after departure, as I said, was given instructions to proceed in accordance with his flight plan at 21,000 feet, climbing from on top over Los Angeles to 21,000 in accordance with visual flight rules.

The flight reported over Palm Springs intersection at 10:37, mountain standard time at 18,000 feet, climbing, subsequently reporting over Needles, Calif., at 10:58, mountain standard time at 21,000 feet, estimating Painted Desert 11:31 mountain standard time.

Mr. HINSHAW. This map we have before us here shows that the intersection is at, I believe, Thermal instead of Palm Springs.

Mr. GARRISON. The Palm Springs intersection, sir, is the northwest course of the Thermal low-frequency range and the east course of the Riverside low-frequency-radio range. And that position is approximately 18 miles north northwest of the Thermal low-frenquency-radio range.

Does that clarify it, sir?

Mr. HINSHAW. That clarifies it.

Mr. ROGERS. May I ask one question there, Mr. Chairman?

Mr. HARRIS. Yes.

Mr. ROGERS. Mr. Garrison, was there any communication at all with the UAL plane as to the fact that the TWA plane had gone to 21,000 feet?

Mr. GARRISON. On our part; no, sir.

Mr. ROGERS. You do not know of any such communication?

Mr. GARRISON. I am not aware of it.

Mr. ROGERS. By the Government agency who did know that there were two planes that left at approximately the same time and that they were both flying at 21,000 feet after 1058 and that their paths would cross?

Mr. GARRISON. That is an assumption on our part; yes, sir.

You are speaking of the CAA when you speak of the Government?

Mr. ROGERS. Yes, sir.

Mr. GARRISON. Yes, sir.

Mr. WILLIAMS. At what time were the paths supposed to cross?

Mr. GARRISON. I beg your pardon?

Mr. WILLIAMS. At what time were they supposed to intersect?

Mr. GARRISON. That I do not have projected because they are in uncontrolled airspace.

And at this moment may I again go back to the responsibility of traffic separation that we have as far as airways versus off-airways?

Mr. WILLIAMS. I understand the responsibility. I was wondering if that had been calibrated.

Mr. GARRISON. We have it calibrated here, sir. As far as the controller, I do not know.

Mr. WILLIAMS. Based on information that you had as to their speeds and so forth?

Mr. GARRISON. I do not believe, to the best of my knowledge, that our controller in the Los Angeles or Salt Lake center projected on a map their estimated time of crossing out here east of the Painted Desert area.

Now, on the thousand on top, or the VFR, I would like to clarify this point, if I may:

The question was asked as to why could we permit TWA to fly at an altitude of 21,000 feet with United at 21,000 feet. Insofar as control on civil airways is concerned, the both aircraft were at all times under complete control and were provided all separation required.

Mr. HARRIS. Under complete control?

Mr. GARRISON. Under complete control of Air Traffic Control as long as they were on designated Air Traffic Control space.

Mr. HARRIS. Yes.

Mr. GARRISON. And the fact that TWA was refused 21,000, he was advised of United as being the reason for that.

Mr. ROGERS. But as far as you know, United was not advised of TWA?

Mr. GARRISON. As far as I know, he was not.

May I say something about this 21,000 feet of TWA.

United was approved for an altitude of 21,000 feet——

Mr. HARRIS. On instruments all the way through?

Mr. GARRISON. If United Air Lines had been flying on solid instrument conditions, he would have maintained a solid flight under instrument conditions, weather conditions, without regard to change of altitude. He had priority at that altitude. If that flight had been under control on an airway and TWA had requested 21,000 and insisted upon 21,000, it obviously would not have been possible to have placed 2 aircraft at 21,000 under such conditions.

In that case, where we have two aircraft at one altitude on airways under controlled space, we space them with a minimum of 10 minutes flying time at the same altitude in the same direction. And we also space them with a thousand-foot separation vertically.

So insofar as another aircraft on an IFR clearance at 21,000 feet operating in the controlled airspace, that flight carried with it a block of airspace reserved for his use of at least 10 minutes this way, 10 minutes behind, a thousand feet above and a thousand feet below.

Air Route Traffic Control does not provide control services for aircraft flying purely under visual flight rule conditions or visual flight rule plans.

Mr. HARRIS. You do not provide control?

Mr. GARRISON. No, sir.

Mr. HARRIS. Is that because of procedure or the rules or the law or by choice?

Mr. GARRISON. That is because of the law, and it is the law.

Mr. HARRIS. All right.

Mr. GARRISON. And flying in such conditions, it is the total responsibility of the pilot to observe and to be observed.

Now, as to the thousand on top, while the pilot reported at 21,000 feet, it did not give him, or would not give him, had he been flying on controlled airspace, the right to any part of the 21,000-foot block if he had encountered any visibility restrictions or weather conditions which would not give him the visibility he needed to see and to be seen. Therefore, a flight that is cleared at least a thousand on top must divert his course around, over, or under any obstruction to maintain that separation.

Also, a flight at 21,000 in controlled airspace, when he can see and be seen, we do not assure him air traffic control, cannot assure him that he has exclusive use of that 10 minutes before and after and a thousand here and there, because there may be many aircraft on the airways, crossing the airways, in uncontrolled space flying visual flight rules, if I make my point clear. That man's block of space reserved for him provides him with separation from another man with the identical block of space, but does not assure him that he is the only aircraft occupying that space when visibility is such that he can see or be seen. There may be many aircraft using this airway.

Therefore, the same thing would apply outside of controlled airspace. Despite the fact that TWA was aware of United's proposed flight at 21,000, there could have been other aircraft out there in the space that TWA, United, or no one else was aware of.

So again, Air Traffic Control provides, shall we say, reserved blocks of airspace only on these controlled airways. And then when the weather conditions permit, other aircraft may be flying indiscriminately thoughout that area without regard to air traffic because there is no requirement.

Mr. MACDONALD. Could I ask one question?

Is there controlled airspace which would go from coast to coast, or are these just running points with gaps of controlled airspace between them?

Mr. GARRISON. To answer, sir, there are controlled blocks of space throughout the United States, both east, west, north, and south, and in some cases diagonally joining.

Mr. MACDONALD. Is there controlled space going from Los Angeles to Chicago in which a plane could get on and just stay on there and know that everything is clear and that he has the priority for that clear space?

Mr. GARRISON. There are airways provided from Los Angeles to Chicago. But I would like to say again that the pilot may get on there and receive his block of airspace. There may be other flights in that same airspace so long as weather conditions permit other people to fly VFR without an IFR flight plan.

Mr. HALE. If you are not in a controlled airway and you run into an overcast, then it is just a matter of luck whether you are going to encounter somebody else in the same place?

Mr. GARRISON. Would you restate the question, sir? I am sorry.

Mr. HALE. Suppose you are flying in uncontrolled space off the airways and you run into an overcast. Is it not just a matter of luck whether somebody else is going to be in the same overcast and bump into you?

Mr. GARRISON. I would prefer, sir, if I may, to defer that to one of our safety people.

Mr. HALE. I wish you would. It is a rather important question.

Mr. MACDONALD. Is it true, sir, that when a passenger boards a plane in Los Angeles, his life is really in the hands of the eyesight of the pilot and his alertness in being able to see 360 degrees as to what is in the air around him?

Mr. GARRISON. I cannot answer that, sir. That would be a compromised answer.

I would say, certainly, that the pilot should be as careful as he can to observe every possible flight condition that would help him in planning his flight. I cannot answer you as far as saying emphatically that is the case.

Mr. HARRIS. Does that conclude your statement?

Mr. GARRISON. Yes, sir.

Mr. HARRIS. Are there any further questions?

Thank you very much, Mr. Garrison.

Mr. GARRISON. Thank you, Mr. Chairman.

Mr. HARRIS. It is now a quarter to 1 by my time.

The committee will recess until 2 o'clock, at which time the committee will meet in executive session.

(Whereupon, at 12:45 p. m., the committee was recessed, to reconvene at 2 p. m. in executive session, thereafter to proceed in open session at 6:35 p. m.)

AFTERNOON SESSION

(The subcommittee was reconvened in open session, at the expiration of the executive session, at 6:35 p. m.)

Mr. HARRIS. The committee will come to order.

At this time the committee will hear Mr. Oscar Bakke, Deputy Director of the Bureau of Safety Regulation of the Civil Aeronautics Board.

STATEMENT OF OSCAR BAKKE, DEPUTY DIRECTOR, BUREAU OF SAFETY REGULATION, CIVIL AERONAUTICS BOARD

Mr. HARRIS. Mr. Bakke, will you give your full name for the record and the position that you have with the Civil Aeronautics Board?

Mr. BAKKE. My name is Oscar Bakke, and I am Deputy Director, Bureau of Safety Regulation of the Civil Aeronautics Board.

Mr. HARRIS. How long have you been Deputy Director?

Mr. BAKKE. I have held that position for about 2 years.

Mr. HARRIS. What was your position prior to becoming Deputy Director?

Mr. BAKKE. I have been with the Civil Aeronautics Board for approximately 10½ years. For the 4 years immediately preceding my appointment as Deputy Director, I was Chief of the Air Carrier Division, which is one of the divisions of the Bureau of Safety Regulation.

Mr. HARRIS. In other words, you have been actually in the Bureau of Safety for 10 years?

Mr. BAKKE. Yes, sir. For the first, approximately 4 years of that period, the functions of safety regulation and safety investigation were in the same bureau of the Board, and during those first 3 or 4 years my work was in the accident-investigation field. Since that time it has been in the field of safety regulations.

Mr. HARRIS. Are you a pilot?

Mr. BAKKE. Yes, sir.

Mr. HARRIS. For how long?

Mr. BAKKE. I have been a pilot for about 16 years.

Mr. HARRIS. Commercial?

Mr. BAKKE. Well, sir, I hold an airline transport pilot rating. I have never flown commercially.

Mr. HARRIS. Most of your flying has been civilian?

Mr. BAKKE. Approximately three-quarters of all of my flying experience has been military, and the other one-quarter with the Civil Aeronautics Board.

Mr. HARRIS. With this qualifying preliminary statement, it has been reported to us that there was some interpretation of the Bureau of Safety Regulation given this morning by one of the witnesses in connection with the experience in this particular matter out of Los Angeles and that the record should be cleared up just in case it would be interpreted as an application to the rules themselves, and that you wanted an opportunity or thought there should be an opportunity to clarify it.

Mr. BAKKE. There were a few remarks, Mr. Chairman, which have been made which I believe are in need of clarification. There are a few questions which have been raised by the committee which it appeared to me were not fully or satisfactorily answered, and I think it might be well if, in at least a few matters, some clarification were attempted for the record.

Mr. HARRIS. We would be very glad to have you do that for us, Mr. Bakke, particularly in view of the fact that we have heard witnesses this afternoon who have related details of their particular work in connection with the incident under consideration here.

Mr. BAKKE. Mr. Chairman, first I should like to point out that there are two bodies of regulations which are pertinent here: One, and the more pertinent, the air traffic rules which are contained in part 60 of the Civil Air Regulations. There is another body of regulations which is pertinent contained in part 40 of the Civil Air Regulations. The former are the air traffic regulations, which are generally applicable to all who fly; the latter are the scheduled domestic air carrier certification and operating rules. The latter part is applicable particularly to carriers such as the two carriers who were involved in this accident.

I might say in passing, in order to state certain it is clear what the relationship in this respect is between the Board and the CAA, that the Board in this particular technical field serves as, you might say, a legislative body. We prepare the standards—the regulations.

So far as the field of air traffic is concerned, the Board operates nothing. We do not operate any communications facilities or air traffic control facilities.

The act makes it very plain that the Board is to prepare the standards on the basis of which the traffic separation function is provided.

I might also state that the Board does not attempt to regulate, nor, in my judgment, did the act contemplate that it should, with respect to the procedural or techniques aspects of air traffic control. These are the functions of the Administrator.

But in part 60, certain regulations have been promulgated which establish who may fly and under what conditions. Part 60 differentiates between two broad classifications of air traffic, the VFR traffic, or visual flight rules traffic, and the IFR traffic.

Now, with respect to visual flight rules traffic, the Board makes the assumption that where a pilot is able to see and avoid other traffic, that he shall have complete responsibilty for seeing and avoiding traffic. Where it is physically possible, where he may reasonably be expected to perform that function, he shall have that function. This is a very important principle because, unless one understands this, one does not understand part 60.

It then states that under certain conditions—and those conditions are primarily determined by the capacity of the air traffic system—the Administrator will authorize operations of aircraft under conditions where pilots are not able to see and avoid other traffic, and therefore, in order to fly, require some ground organization to accomplish traffic separation or positive separation for the pilots who are not able to do so for themselves.

Now, when I say that this is limited to the capacity of the traffic system, I believe that the committee should take particular note of this fact because it is important to distinguish between the duty of air traffic control with respect to the provision of positive separation within controlled areas, which is the only place geographically where the CAA may provide positive control, and within what is called in the regulations the "elsewhere" area.

Getting back to the operations such as those that were involved here, I would like to state first that both of these air carriers in asking for a clearance from air traffic control were IFR traffic.

Now, I believe there was some confusion about that this morning. Both of these airplanes were IFR traffic for the duration of their operation on the Federal airways. Now, it is true that there were certain conditions which were imposed on these operations, and that it has been said that both were instructed to climb VFR.

I should like to add that the instruction given to both of these flights was that they should climb in VFR conditions. It is the VFR conditions which must be emphasized here.

The Administrator, in the CAA air-traffic-control function, is providing separation for aircraft such as these where they are not capable of providing separation for themselves, under the conditions which part 60 says they may prescribe. And in this partlcular case the condition which was prescribed was that they climb to their respective altitudes under VFR conditions. They were, nevertheless, IFR traffic, both of them.

Now, the traffic separation afforded by the air traffic control system was effective only for that portion of time that both aircraft were within controlled areas.

The ANC/IFR Manual, that is the Air Force, Navy, Civil Manual of IFR Procedure, which sets forth the procedure whereby air traffic

control accomplishes this function, makes it clear that in clearances such as were given to these flights the flights are cleared to maintain a given altitude while in controlled areas. Outside controlled areas there are no instructions of the air traffic control system which are pertinent or which are binding. So, the moment both of these aircraft left controlled airspace they were, so to speak, on their own.

One other thing that I should emphasize is that part 60 permits VFR operations on airways as well as off airways so long as the weather conditions are such that pilots may reasonably see and avoid other traffic. That is so, even if part of that airspace has been assigned to flights which have requested altitude assignments. This is spelled out very clearly in the flight information manual.

The knowledge of this fact is required knowledge for all who possess airline transport pilot ratings. It says, in effect, that when a pilot is assigned an altitude by air traffic control in controlled airspace, but he is actually flying under that clearance in weather in which he may reasonably be expected to see other aircraft, he is then burdened to see other aircraft and avoid it, notwithstanding his IFR clearance.

Now, the committee has asked whether this is a reasonable limitation. I would like to make it plain—and I speak now pretty much off the cuff, and I have no statistics available, but I think this is a reasonably close estimate—that the total capacity of the air traffic system is adequate to handle only a small percentage, it has been said about 15 percent, of all of the traffic that moves in United States airspace. The remainder of the traffic moves without the assistance of the air traffic control system.

Mr. HARRIS. What percentage of the commercial airlines traffic moves under control?

Mr. BAKKE. I am not able to furnish any statistics with respect to that question, Mr. Chairman.

Mr. HINSHAW. It would be a much higher percentage, though?

Mr. BAKKE. It would be a higher percentage than that. In my judgment, however, it would still not be a majority of the total traffic. It would still be less than half.

Mr. FLYNT. Less than half of the total commercial traffic?

Mr. BAKKE. Yes, sir; of the total commercial traffic.

Mr. HINSHAW. But it would be a very high percentage of the traffic that moves in the Northeast, for example?

Mr. BAKKE. That would not be my judgment, sir.

Mr. HINSHAW. I think you are in error.

Mr. BAKKE. As I say, I have no statistics which I am able to present to the committee. However, my guess would be that if we were to count them, for instance, by number of flights that the majority of air-carrier operations moves under visual flight rules. However, I am not able to confirm that statistically at this time.

The point, then, that I would like to make, Mr. Chairman, is that part 60 takes account of the fact that any restriction which has the effect of prohibiting a flight unless it is accommodated by the existing air traffic control system would have the effect of solving the traffic density problem by eliminating the traffic. It would be in effect to ground considerable current operations. So the regulation permits VFR traffic to occupy the same airspace which the air traffic

control system will have assigned to IFR operations when weather permits.

Mr. WILLIAMS. At that point, may I ask a question?

It does not grant VFR traffic the permission in uncontrolled areas to occupy the airspace assigned to IFR traffic under actual instrument conditions, though, does it?

Mr. BAKKE. That was to have been my next point, sir, that two aircraft occupying, let us say, adjacent airspace who are flying at the same altitude and near each other, one of whom has been assigned a given altitude and the other of which is traveling VFR, have the responsibilities to see and avoid other traffic until they enter clouds or until they approach a cloud.

Now, the one who has an air traffic control clearance and an assigned altitude has been authorized to remain at his altitude and can continue his course and enter the cloud. The other aircraft is by regulation prohibited from entering the cloud. He is prohibited from allowing himself to come into a situation where he may no longer see and avoid other traffic.

Now, a clearance which calls for 1,000 on top operations is substantially such a clearance. Two aircraft, both of whom are operating at 21,000 feet in controlled airspace have the same obligations to see and avoid other traffic. One merely has the right to go on instruments and the other does not. That is the only important distinction between them.

Even this distinction, however, disappears when the operation is off airways, because when the operation is off airways there is no requirement, there is no condition imposed, by air traffic control which is binding on the flyer.

There are certain procedures which are mandatory in part 60 which serve to take some of the critical effect of, you might say, random VFR and IFR operations off airways. There is a requirement which is known as the quadrantal altitude rule.

Mr. HALE. Known as what?

Mr. BAKKE. The quadrantal altitude rule, which requires that aircraft flying in the northeast quadrant of the compass shall fly at odd-thousand feet—at 1,000, 3,000, 5,000, and so on; aircraft flying in the southeast quadrant fly at odd-thousand foot altitudes plus 500 feet, and so on around the quadrants of the compass. By such a device, aircraft are roughly assured 1,000 foot vertical separation when traveling on reciprocal courses, or 500 foot separation when traveling on converging courses in two different quadrants. They are not protected, however, against converging courses within the same quadrant.

There are other regulations in part 60, such as the right-of-way rules which are procedural in nature and which indicate the procedure to be followed by two pilots who may be approaching one another in flight. The requirement merely is one which indicates which aircraft shall give way to the other.

But nowhere in the regulations is positive separation provided for off airways.

The question was raised, and I believe that there was some confusion between the use of CAA communications services as opposed to company communications services.

Part 40, in particular section 40.34, requires that all domestic scheduled air carriers possess a private air-ground communication

service. It also provides that the administrator may authorize the use——

Mr. HINSHAW. Would you repeat the statement you just made about private radio service?

Mr. BAKKE. Section 40.34 of the Civil Air Regulations requires that all scheduled domestic air carriers maintain a communications system independent of that of the Federal Government. All scheduled air carriers have such a communications system.

Mr. HINSHAW. Under what arrangement?

Mr. BAKKE. In domestic United States, AIRINC, Aeronautical Radio Inc. furnishes, or is the licensee for, all stations which serve scheduled air carriers. AIRINC, in fact, operates some services for air carriers jointly. In the majority of cases the communications stations are operated by the air carriers themselves.

I may use as an illustration—and I have no intimate personal knowledge—but I am informed that Aeronautical Radio Inc. operates a station at Los Angeles for a large number of carriers, of whom United Air Lines is one. TWA, on the other hand, maintains an independent communications service at Los Angeles and operates it independently. In both instances, however, the AIRINC is the licensee of the station.

This, however, is an administrative relationship between the carrier and AIRINC.

Mr. HARRIS. Are there other AIRINC stations in this area?

Mr. BAKKE. Yes, sir.

As I explained before, all stations are, at least so far as the FCC is concerned, are AIRINC stations in the sense that they are the licensees for the stations.

Mr. HARRIS. Whether it is a private station for one company or whether it is——

Mr. BAKKE. Or whether it is used jointly for many air carriers; yes, sir. There are other such stations in the area.

Now, this same requirement continues and says that the administrator may authorize scheduled air carriers to use air-ground facilities of the CAA for purposes of communicating for air traffic control reasons.

In the case of control towers, in the case of communications with approach control or departure control facilities, or in the case of direct communications with the center, these are air-ground communications for air traffic control purposes, and they have been authorized by the administrator.

Notwithstanding the requirement for an independent communications service, therefore, these carriers may and normally do communicate directly with the facilities of the Administrator.

There is just one further observation that I might make, and that is that section 40.30, as well as 40.31 and 40.32, are the rules which govern the high altitude long-distance flights such as those which were involved in this accident.

These regulations permit off airways operations. These regulations permit off-airways operations in IFR weather as well. The only safeguard that the regulation permits so far as the traffic hazard is concerned is to include a condition that the Administrator may, in issuing air carrier operating certificates, deny the use of a route under instrument flight rules when he finds that a peculiar collision hazard

or traffic density hazard is found to exist on that particular route.

Without wishing to appear to have evaluated this particular route, it would be my judgment that this route would certainly not be a route in which the Administrator would be expected to find a unique traffic density problem. I believe that such testimony was given earlier to the committee.

Mr. HARRIS. Do I interpret you correctly when it occurs to me that you have just indicated that you do not feel the present rules and regulations and procedures, or even the law, need revising in order to provide more adequate safety in air traffic?

Mr. BAKKE. No, sir; I do not think that would be a fair statement, sir.

Our air traffic rules are in a continuous state of development. As our traffic hazards increase, our scrutiny over our regulations also increases.

I think it would be more fair to say that we are now passing through a period of transition in which it will become necessary for us to give particular attention to conditions other than the conditions which are now limiting in part 60.

I can give you just a few examples of that, sir.

We have just completed a high density area experiment in the Washington area. The rule which authorized this high density experiment is to terminate on July 31. The Bureau of Safety Regulations has under development certain——

Mr. HALE. You say rule to terminate. Do you mean a rule of your own?

Mr. BAKKE. It is a special civil air regulation promulgated by the Civil Aeronautics Board.

As a result of this investigation, the Bureau of Safety Regulations is now developing notices of proposed rulemaking which propose to put into effect some of the conditions which were the basis for the high density area experiment in Washington. One of those, for instance, is speed control in high density areas.

We have a proposed rulemaking which is out for public comment now which proposes to increase visibility limits in control zones.

We are working on the notice of proposed rulemaking which would propose to increase the vertical separation of aircraft at high altitudes to a minimum of 2,000 feet. We are also working on a notice of proposed rulemaking which would increase the scope of the air traffic control function at high altitudes.

In other words, this is a regulatory concomitant to the Administrator's 5-year plan, which looks toward ultimately the imposition of an area type of control of high altitudes.

These are things which are in process right now. And in the light of those, I could hardly say that the Board is satisfied with its present regulations, but that obviously it is not. We are working continuously toward improvement in the regulations to take account of the higher speed of aircraft and——

Mr. HARRIS. Do any of the commercial airlines follow the airways at all times?

Mr. BAKKE. I daresay, sir, it is possible. I would say this: that I doubt that there are any large trunk carriers that do not have at least one route segment which is off airways.

Mr. HARRIS. What would be wrong with requiring commercial trunklines to follow the airways and be subject to air-traffic control?

Mr. BAKKE. Well, sir, I suppose the principal reason would be the lack of flexibility. This, in some respects, needs perhaps somewhat longer routing and therefore a greater expense to the air carrier.

However, I think there are more significant elements that are involved. We have tried in our air-carrier rules to allow air carriers the greatest flexibility in their operation. We provide, for instance, that the air carrier may choose routes, so far as these long-range, high-altitude routes are concerned, that may on one day go via El Paso and the other day by North Platt, giving practically the entire country over which to work.

We believe that this greater flexibility permits the air carrier to select the area of best weather, to circumnavigate thunderstorms, for instance. We think that a pilot in flight should have the discretion to fly off airways when he thinks in his judgment it is safer to do so. If he sees, for instance, right on the airway a thunderstorm which he believes he should avoid, I think it makes good sense, sir, leaving with the pilot the discretion to fly the route which in his judgment is best.

Mr. HARRIS. How many traffic-control stations do we have in the country?

Mr. BAKKE. I am not able to answer that question, sir.

Mr. FLYNT. Twenty-six, from the testimony given this morning.

Mr. HARRIS. We have communication stations to report to all over this country. There is no place you can touch in the country without having communication stations to contact; is there?

Mr. BAKKE. Sir, I think that is fair to say.

Mr. HARRIS. Why don't we use them then?

Mr. BAKKE. We do, sir.

Communications is not the problem which prevents the exercise of air-traffic control in all airspace, sir, nor is it the problem which has, at least today, discouraged a requirement which would prevent the use of off airways for this type of operation.

Mr. HARRIS. I am just saying this from what little I know about it, but I think that the Board and everyone else involved in this are going to have to consider that this transition has really taken place, and it is probably getting way out ahead of us because we are coming into the jet age with these jet planes moving out so fast.

When you talk about flexibility, if we do not have greater control over them, we are going to find ourselves, in my humble opinion, in a very, very serious situation. We are already reaching that stage in the East, the metropolitan New York area, Philadelphia, and all through there, where they are reporting, as you know much clearer than I, serious conditions now.

We have already arrived at that time. I am afraid we are not keeping up with it.

Mr. HINSHAW. Mr. Chairman, I would like to recall to the minds of the committee members that we passed a bill some years ago authorizing the expenditure of funds for the testing of the movement of jet aircraft in traffic, and suggesting that two B–46's, or something of that nature, jet aircraft, be turned over to the Civil Aeronautics Administration and the Board for such experimental testing of traffic-control measures.

The Appropriations Committee of the House has not seen fit to make appropriations for that purpose up until this time. I believe I am correct in that.

Mr. HARRIS. I think it is a matter that should be given attention by the committee.

Mr. HINSHAW. We passed a bill.

Mr. WILLIAMS. I have a question I would like to ask Mr. Bakke in regard to the records of the scheduled air carriers, or carriers of passengers for hire.

How many midair collisions have occurred between two passenger aircraft, commercial passenger aircraft, or scheduled passenger aircraft, since the CAA regulations have been in existence?

Mr. BAKKE. I have made no particular study, sir, of that particular question. I can recall two offhand.

Mr. WILLIAMS. Under what conditions?

Mr. HALE. Two besides this one, you mean?

Mr. BAKKE. Yes; I can recall two offhand. And if there were any more, it would be at the most one or two others.

Mr. WILLIAMS. I mean where both planes were passenger-carrying commercial aircraft.

Mr. BAKKE. Yes, sir.

Mr. WILLIAMS. Airliners, in other words.

Mr. BAKKE. Yes, sir. We had a collision between United and American, I believe, in the northeast part of the United States, and approximately 9 years ago we had a collision between Eastern Air Lines and Universal Air Transport near Havre de Grace, Md. I am inclined to doubt that there were any others.

However, as I say, I have made no particular study.

Mr. FLYNT. Was there not one in Indiana; Michigan City, Ind.?

Mr. WHITE. Michigan City, Ind., was United and American.

Mr. BAKKE. Yes; that was the United-American collision.

Mr. WILLIAMS. One more question.

Has there ever been a collision between two airliners, for lack of a better descriptive word, carrying passengers when one or both of the airliners were flying with IFR clearance?

Mr. BAKKE. Yes, sir. In the case of the Eastern-Universal collision, it escapes me now which of them had the IFR clearance, but one of them was cleared at 2,000 feet IFR—my recollection is that it was the Universal aircraft—and the other aircraft was proceeding VFR.

In the Michigan City accident, my memory fails me, sir. I don't recall whether either or both had IFR clearance. I have made no recent study of this accident and I am rather reluctant to rely on my memory at this time.

In the one case it is definite that they had; in the other I am not certain.

Mr. WILLIAMS. Well, in the many years that they have been flying, and as many millions of passenger-miles that our civilian airliners have flown, I would make the observation that three of them—and I believe that is all you pinpointed—would indicate a very excellent safety record, particularly in view of the congested traffic that you will find in certain areas of the country. And I am inclined to believe that the crackup that occurred the other day would be very, very

unlikely to happen again, even under similar circumstances, particularly because of the area in which they were flying.

Would you agree with that statement, or observation, rather?

Mr. BAKKE. Well, sir, I might make this note:

The particular area within which this collision occurred——

Mr. WILLIAMS. Is not a congested area.

Mr. BAKKE (continuing). Was not the type of area that has been giving us a great deal of concern in recent years. It is not this type of accident and the circumstances under which it occurred, or this type of thing, at which we have been directing our principal attention. We have been concentrating on the high density areas because there is where we feel that the probability of collision is at its highest.

We were shocked, I suppose, as we are with all accidents, but particularly surprised to find ourselves confronted with this type of a situation in the area involved. It is one which we think reasonably we did not have reason to expect.

Mr. HARRIS. You did not have reason to expect all those crackups in the Teterboro and New York area, either, did you?

Mr. BAKKE. Well, sir, I suppose we have no reason to expect any of them, in a true sense.

I might say that, relatively speaking, this was one which was perhaps further removed from our minds than other accidents in recent years.

Mr. HINSHAW. It reminds me somewhat of a fellow driving along a country road in an automobile and he would go for miles and miles and miles and pass very few vehicles. But somebody will dart out of a side road and clobber him. He can go through the most difficult and dense traffic of a city and pass thousands of vehicles and have a great many close shaves and never be touched.

Going around Dupont Circle, for instance, in Washington, I am scared to death so I watch carefully. But I am liable to be a little lax on a country road.

Mr. HARRIS. Are there any further questions?

Do you have any further statement to make?

Mr. BAKKE. No, sir; I do not.

Mr. HARRIS. Let me thank you very much.

Mr. BAKKE. Thank you, Mr. Chairman.

Mr. GERALD F. WHITE. May I have the privilege of addressing the committee for a moment? Iwould like to clarify a statement that Mr. Bakke made.

Mr. HARRIS. I think you had better identify yourself for the record.

STATEMENT OF GERALD F. WHITE, OFFICE OF THE GENERAL COUNSEL, CIVIL AERONAUTICS ADMINISTRATION, WASHINGTON, D. C.

Mr. WHITE. I am Gerald F. White of the CAA General Counsel's Office from Washington.

I would first like to say that I thought Mr. Bakke's statement was an excellent presentation of the effect of the Civil Aeronautics Board rules.

Mr. HARRIS. Let me say this off the record.

(Discussion off the record.)

Mr. WHITE. Mr. Chairman, I did not ask the permission of the committee to testify for the purpose of rebuttal.

I wish first to state that the statement of Mr. Bakke was, in the thinking of those of us from CAA, a very complete and very ample statement of the conditions that exist with reference to the CAB rules as far as they concern air-traffic control.

There was one statement which Mr. Bakke made that was of some concern to us, and I think it may have been a misunderstanding. That was that under 40.32 of the regulations, the Civil Aeronautics Administration in a high-density-traffic area had the authority to disapprove a high-altitude route for the scheduled air carriers.

It has been our understanding that the proviso section of 40.32 dealing with high-altitude operations did not leave us with that authority, even though there were known traffic densities in an area.

I would really like Mr. Bakke to comment on that if the committee cares to hear it, as to whether we misunderstood his position, because that has not been the CAA's view of its authority under 40.32. We have felt that the CAA lacked the authority in a high-altitude operation to approve or disapprove the route, irrespective of the traffic density that might be in it.

That is the only statement that I wish to make to the committee, and in effect, it is a plea for clarification for the committee and for the CAA, too.

Mr. HINSHAW. Does the CAA feel that it has any authority to disapprove a route?

Mr. WHITE. High-altitude routes; no, sir, because the route approval sections of part 40, namely 40.30, 40.31, and 40.32 all contain a proviso which make them inapplicable to high-altitude operation. And that question I would like clarified if we misunderstood, because it is of some importance to us, and I should think to the committee, in terms of what responsibility the CAA may have in this area.

With that, I have nothing further, unless there are some questions that the committee would care to ask.

Mr. WILLIAMS. Mr. Chairman, may I make a suggestion as to that. Whether there has been a misunderstanding or not, of course, only Mr. Bakke and this gentleman know. I would suggest that we wait until we get back to Washington to thrash out the details of section 40.30.

Mr. WHITE. It may be that Mr. Bakke does not disagree with me. He gave some very able testimony.

Mr. WILLIAMS. I would make a suggestion in order to save time that if Mr. Bakke feels that he has been misunderstood, or that he has made an error, I would suggest that the committee give him permission to submit a statement to the committee telling us exactly what he did intend to say. I think that will save time.

Mr. WHITE. I hope the committee does not think I am accusing Mr. Bakke of a misstatement. This was a question we thought perhaps might stand clarification because it did affect what responsibility we have.

Mr. HARRIS. I think it is highly important that Government agencies understand each other in the responsibilities that they have. I have been down to departments in the same building where it seems to me that it would not be too much difficulty to go around to somebody else's office and try to get an understanding of what is meant by certain sections.

Mr. WHITE. Believe me, I did not think that a misunderstanding existed. I thought perhaps that the committee might have been misled as to the responsibility of CAA and I wish that to be stated in the record.

Mr. HINSHAW. I for one was misled.

Mr. WHITE. Thank you, sir.

Mr. HARRIS. We are glad to have the record speak for the benefit of the committee.

This will conclude this portion of the hearings at this point of our trip on this all-important problem. The committee has heard some very interesting, highly informative testimony which is very important.

I might say this off the record.

(Discussion off the record.)

Mr. HARRIS. On behalf of the committee, let me thank the people who have come here today from both the agencies of Government, that is, the Civil Aeronautics Board, the Civil Aeronautics Administration, and Department of Commerce, and those who locally have been very cooperative, particularly the Army, and those who have been involved with the problem over at Grand Canyon now, that very difficult problem.

The description that we have had of this entire matter has been probably the most horrid in some ways that one could conceive.

We want to thank the press and the television and other people here locally for their splendid cooperation. I know that this trip has been highly beneficial to the subcommittee in its study of the overall problem, and certainly will emphasize the importance of the continuance of the overall investigation which we started some time ago and which we will continue during this year and perhaps during the recess, or following the adjournment of Congress.

You know, it is very seldom in my 16 years on this committee that it happens, and I do not believe that I have thought of it myself or heard anyone else compliment, as should be done, the stenotypist that we have with us. I think Don Johnson deserves the highest commendation and compliment that we could give because he has been at this little black box here all day, and I know that he is wearied down but he is still going.

Let me thank you and compliment you and pay you this tribute, Don.

Again I thank all of you, including the hotel management for the courtesies extended to us.

The committee is adjourned.

(Whereupon, at 7:20 p. m., the subcommittee was recessed, subject to the call of the Chair.)

AIRSPACE USE STUDY

WEDNESDAY, JULY 18, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON TRANSPORTATION AND COMMUNICATIONS,
OF THE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D. C.

The subcommittee met at 10 a. m., pursuant to notice, in room 1334, House Office Building, Hon. Oren Harris (chairman of the subcommittee) presiding.

Mr. HARRIS. The subcommittee will be in order.

The Subcommittee on Transportation and Communications has met this morning to resume the hearings in the question of air safety and airspace utilization, including also the investigation of navigation aids we have had under way for some time. At this particular session, the hearings will of course be conducted on matters pertaining to the unfortunate accident that occurred at the Grand Canyon just a few days ago.

This committee had a very interesting and, we believe, a highly beneficial hearing in Las Vegas a few days ago, and a trip to the Grand Canyon where the accident occurred. It was thought at that time that it would be advisable for the subcommittee to secure more information with reference to the weather conditions, and also to have as witnesses some of the pilots of the various planes flying this air route from day to day.

We have a number of pilots here, including the president of the Air Line Pilots Association, the chairman of the TWA Air Safety Committee, and others. First, may I inquire whether we have a copy of the weather report which was referred to? Mr. Halperin, you advised us out at Grand Canyon the other day that the report was available and we would have it.

Mr. DAVID HALPERIN (chairman of the TWA Air Safety Committee). Well, this came on me rather suddenly, and we made no special preparations. I did not know what would be required of us and we decided to come and try and answer anything that anyone would care to ask us. However, we brought no written material of any kind.

Mr. HARRIS. Mr. Cunningham, I understood you to say a few days ago that the weather report would be available, and that there would be someone here who could interpret it for us.

Mr. MARTIN W. CUNNINGHAM (member of the professional staff of the committee). I would like to check on that, Mr. Chairman.

Mr. HARRIS. Mr. Sayen, I have your name as the first witness. Would you care to take the witness chair, please?

STATEMENT OF C. N. SAYEN, PRESIDENT OF THE AIR LINE PILOTS ASSOCIATION, CHICAGO, ILL.

Mr. HARRIS. Now, Mr. Sayen, you are the president of the Air Line Pilots Association?

Mr. SAYEN. Yes, sir.

Mr. HARRIS. Your name is Clarence N. Sayen?

Mr. SAYEN. Yes, sir.

Mr. HARRIS. With your headquarters in Chicago, Ill.?

Mr. SAYEN. That is right.

Mr. HARRIS. The purpose of this hearing today is to try to develop information regarding the conditions from Los Angeles over the areas, or in the area, where the accident occurred. Now, do you have any information regarding that route?

Mr. SAYEN. We have here with us, Mr. Chairman, the pilots who fly that route normally, and they are familiar with the route and procedures by which it is flown. We have here with us——

Mr. HARRIS. What are the pilots' names that you have referred to?

Mr. SAYEN. We have Captain Halperin, who is the central air safety chairman for the Air Line Pilots Association group on Trans World Airlines, and who has also served as chairman of our investigating committee for this accident for the TEA group. We also have with us Captain Lovett, who is central air safety chairman for the association for the pilots of the United Air Lines and also chairman of the United Air Line Pilots investigating committee for this accident.

We also have here with us Captain Stephan, who is the pilot for American Airlines, who flies the route and who flew over the canyon on this route about 10 minutes after the accident occurred and observed and reported on the weather.

We have several other pilots here with us who have served on our investigating committee for this accident in various phases of it.

We can produce or try to answer your questions on any phase of this operation to the best of our ability, based on that sort of background. I thought it wise to bring with us the people who actually flew these routes and who have been concerned with this particular accident, and this air traffic control problem involved in this type of an operation.

Mr. HARRIS. Does Captain Halperin fly this route, too?

Mr. SAYEN. He does not currently fly this route.

Mr. HARRIS. We want the people who flew this route on that day.

Mr. SAYEN. We have here Captain Stephan, who flew this route on that day and passed over this spot 10 minutes after the accident occurred.

Mr. HARRIS. We want him. Do you have anyone here with you who flew this route just before the accident?

Mr. SAYEN. We have here Captain Solomon, who flew over this route about 1 hour prior to the accident.

Mr. HARRIS. We would like to call Captain Solomon first.

STATEMENT OF CAPT. JASPER S. SOLOMON, A PILOT FOR TRANS WORLD AIRLINES, INC.

Mr. HARRIS. Would you kindly identify yourself for the record?

Captain SOLOMON. Jasper S. Solomon.

Mr. HARRIS. And you are a pilot for TWA?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. And your address was?

Captain SOLOMON. 4533 Stansbury Avenue, Sherman Oaks, Calif.

Mr. HARRIS. As was developed a moment ago, Captain, you flew the route from Los Angeles to where on that date?

Captain SOLOMON. To Kansas City.

Mr. HARRIS. What time did you leave—or suppose you just go ahead and tell us your experience on that day, and the situation and the conditions and so forth, as you recall.

Captain SOLOMON. I flew flight 82 out of Los Angeles, departed there at 7:30 a. m., Pacific standard time, with stops at Las Vegas, Albuquerque, Amarillo, Wichita, and Kansas City. On our departure from Las Vegas we had a climb of VFR through scattered clouds.

Mr. HINSHAW. What altitude?

Captain SOLOMON. The base of the clouds were 6,500 feet at this point, and that was about 15 miles east of Hoover Dam. We reached the top of the scattered condition at about 12,000 feet, and our climb to 17,000 feet, which was our cruising altitude to Albuquerque——

Mr. HINSHAW. Did you have an IFR flight plan?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. Therefore, you had a cruising altitude assigned?

Captain SOLOMON. We were cruising at 17,000; yes, sir.

Mr. HINSHAW. Was that assigned?

Captain SOLOMON. Well, you are out of a control area there, sir.

Mr. HINSHAW. Was that the altitude that you were to leave the controlled area and reenter on the other side?

Captain SOLOMON. It was the altitude at which we were supposed to enter the controlled area; yes, sir.

Mr. HINSHAW. On the other side?

Captain SOLOMON. Yes, sir; that is correct.

Mr. HINSHAW. And where did you leave the airways?

Captain SOLOMON. We left the airways immediately after leaving Las Vegas, and it is impossible to be at your cruising altitude at that point, and we would reenter airways at Zuni, N. Mex., at 17,000 feet.

The cloud condition approximately 20 miles west of the Grand Canyon Lodge; there was an undercast at that point.

Mr. HINSHAW. That means it is below 17,000 feet?

Captain SOLOMON. Yes, sir; it was below us. I would estimate the tops at that time were 13,000 to 15,000.

Mr. HARRIS. What is that?

Captain SOLOMON. I would estimate the tops at that time were 13,000 to 15,000.

Mr. HINSHAW. What time was that?

Captain SOLOMON. Our check over Grand Canyon was at 9:58, and that would be approximately——

Mr. HINSHAW. Mountain time?

Captain SOLOMON. Yes, sir; that is correct, Mountain standard time, and that would be 5 to 8 minutes before that time. We flew over this undercast for 5 or 10 minutes.

Mr. HINSHAW. Was it a stratus?

Captain SOLOMON. Yes, sir; it was low stuff, no build-ups in it at that time.

After giving our Grand Canyon check we entered the ADIZ on a radial of 276°, on the Zuni VOR.

Mr. HINSHAW. ADIZ is air defense identification zone?

Captain SOLOMON. Yes, sir; and we were on instruments for approximately 10 to 15 minutes before reaching Zuni. In other words, we went on instruments after we passed through the ADIZ.

Mr. HINSHAW. Was that because you did not have visibility, or for some other reason?

Captain SOLOMON. It was a cloud condition.

Mr. HINSHAW. The other side of the ADIZ identification?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. But that was farther east than the Painted Desert.

Captain SOLOMON. Yes, sir; that was just east of the Painted Desert check point.

Mr. HARRIS. How far east?

Captain SOLOMON. That would be, right at the moment it would be an estimate, sir, but it would probably be 5 to 8 minutes east of the Painted Desert check point.

Mr. HARRIS. The Painted Desert is east of the Grand Canyon about how many minutes?

Captain SOLOMON. Well, sir, the Painted Desert check point is a 321° radial of the Winslow, Ariz., VOR, and it is 78 nautical miles north.

Mr. HARRIS. Is that north?

Captain SOLOMON. North of Winslow, Ariz.

Mr. HINSHAW. You mean the Painted Desert check point itself, but the line of position is a line between Bryce Canyon and Winslow.

Captain SOLOMON. It is a radial off of Winslow.

Mr. FLYNT. Is that a 321° radial?

Captain SOLOMON. I believe that is correct. Yes, that is right, and I believe it is 78 nautical miles.

Mr. HARRIS. When you went back on instruments after entering the ADIZ, were you back on controlled airways?

Captain SOLOMON. We had not quite reached the controlled airways.

Mr. HARRIS. Well, what kind of instructions—do you fly on instruments when you are not on controlled airways?

Captain SOLOMON. Well, we had this altitude assigned to us and you are more or less—you do not really have any instructions.

Mr. HARRIS. You are on your own, is that right?

Captain SOLOMON. Just about.

Mr. HARRIS. Well, are you permitted to fly through the clouds, with these weather conditions, on instruments without any control?

Captain SOLOMON. You could legally in that area, sir, out of a controlled zone.

Mr. HARRIS. How can you tell when you might not bump into some other man flying the same conditions?

Captain SOLOMON. Well, that is a problem.

Mr. HARRIS. That seems to be the problem.

Captain SOLOMON. Yes, sir; I agree with you.

Mr. HARRIS. What do you think should be done about it?

Captain SOLOMON. Positive control.

Mr. HARRIS. Over the entire area?

Captain SOLOMON. Over any area that we might be flying; yes, sir.

Mr. HARRIS. Perhaps you are not in a position to answer this question, but are you familiar enough with the background to know why you do not fly under controlled conditions over this area?

Captain SOLOMON. Well, we have not had airways created over this area.

Mr. HARRIS. You do not have an airway established over this area?

Captain SOLOMON. Over this particular area, to put it under control.

Mr. HARRIS. Where is the airway from this area?

Captain SOLOMON. From the Painted Desert check point, it is approximately 78 nautical miles south.

Mr. HARRIS. In other words, instead of flying the airways—which way did you go, over Daggett?

Captain SOLOMON. My flight took me to Las Vegas, and then I went direct from Las Vegas to the Grand Canyon, and direct from the Grand Canyon to Zuni, N. Mex.

Mr. HARRIS. You went from Los Angeles on an airway to Daggett or over Daggett?

Captain SOLOMON. Yes, sir, over Daggett, and to Las Vegas.

Mr. HARRIS. Now, from Las Vegas, you went where?

Captain SOLOMON. From Las Vegas, I went direct to the Grand Canyon.

Mr. HARRIS. That is when you took off from the airways there.

Captain SOLOMON. No, sir.

Mr. HARRIS. You would have had to go down to Prescott, then, would you not?

Captain SOLOMON. That is correct.

Mr. HARRIS. Now, do you have an airway established north of Las Vegas?

Captain SOLOMON. Victor 8 that goes to Denver. It goes over Bryce Canyon, and Grand Junction and Kremmling and on into Denver.

Mr. HARRIS. Where were you cleared for an altitude of 17,000 feet?

Captain SOLOMON. Out of Las Vegas. You mean where did I receive the clearance?

Mr. HARRIS. Yes, that is right.

Captain SOLOMON. I received the clearance at Las Vegas.

Mr. HARRIS. When you left Los Angeles, did you have your flight plans all of the way through?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. And it was cleared?

Captain SOLOMON. Well, my flight plan was delivered to the company, and we gave them the altitudes that we intended to fly, and they in turn gave that flight plan to the airways and at each stop we received the clearance or a clearance to proceed to our next stop. You receive that clearance before takeoff at each stop.

Mr. HARRIS. Now, while you were at Las Vegas, you checked the weather conditions, did you not?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. What information did you receive with reference to the weather conditions to your next stop?

Captain SOLOMON. At Las Vegas, we received only the sequence reports.

Mr. HARRIS. Describe the sequence reports to us.

Captain SOLOMON. The sequence reports are the reports that each station sends in on an hourly basis, and it comes out on the teletype machine and we receive those reports.

Mr. HARRIS. What did the reports reveal?

Captain SOLOMON. Well, the report for Las Vegas was clear and the one for Zuni, N. Mex., and Albuquerque were scattered "Q."

Mr. WOLVERTON. In answer to the questions that have been put to you, you seem to have been depending entirely upon your memory.

Captain SOLOMON. Yes, sir; that is correct.

Mr. WOLVERTON. Is there any log kept on the ship that would reveal these facts and circumstances that you are testifying to?

Captain SOLOMON. Yes, sir; we have a complete log of the weather reports and we turned in, or my first officer turned in a complete weather report over the area that we had flown through when we reached Kansas City. This was after we became aware that there probably was an emergency in existence at that time.

Mr. WOLVERTON. Do you have that log, and is it available to the committee?

Captain SOLOMON. It is not available at this time, sir. It is available, but I do not have it with me. We did not anticipate needing it in this committee.

Mr. WOLVERTON. It seems to me, Mr. Chairman, that that log would be very helpful to us if we could have it in its entirety, and its completeness, rather than depending upon question and answer from a witness who is testifying from memory.

Mr. HARRIS. Who has the log?

Captain SOLOMON. There are several copies of that, and our company has 1, and the CAB has, I believe, 2 or 3 copies of it. There are several copies of it around, sir, but I do not have one myself.

Mr. HARRIS. It was my understanding when I talked to some of your group in Grand Canyon last week that you had men, meteorologists, who had the log and who could describe it. One was to be here today.

Captain SOLOMON. Our meteorologist is in town at the present time. I came in with him last night.

Mr. HARRIS. Does he have the log?

Captain SOLOMON. Yes, sir—I cannot say I am 100 percent sure. I am sure that he does have, but I did not see it.

Mr. HARRIS. Well, for the record again, I had the understanding that he was to be here and he was to give the report. Did he, just by accident, come here this morning or last night?

Captain SOLOMON. I do not know, sir. I started on this flight from Los Angeles, and I just happened to be on the same airplane with him out of Kansas City, and that is not within my knowledge. I do not know what his reason for being here is.

(The information referred to, later submitted, follows:)

TRANS WORLD AIRLINES, INC.,
Los Angeles, Calif., July 6, 1956.

Résumé of weather encountered by flight 82–30 June 1956, LAS–ABQ.

Departed Las Vegas 0811 P. s. t., en route to Albuquerque via direct Grand Canyon, direct Zuni, Victor Airway 12 Albuquerque, at 17,000 feet. Weather encountered during the climb began at approximately the Mead intersection, consisting of scattered strato-cumulus bases 8,000 feet, tops 12,000 feet (mean sea level).

This cloud coverage increased to a broken (sixth-tenths coverage) condition to about Supai Canyon after which the sky was clear. The clear area extended from about Supai Canyon to a point near the ADIZ boundary between the Grand Canyon and Zuni omnirange. From the boundary to Zuni, instrument conditions existed consisting of strato-cumulus and a trace of rime ice. No turbulence was encountered. Just before reaching Zuni, we broke into the clear and from Zuni to beacon 68 broken towering cumulus (6/10) existed necessitating a deviation south of course. We were on and off instruments during this portion of the flight with light turbulence and no icing in the clouds.

See attached cross section for times, positions, and altitudes, both flight and weather.

PERRY A. SCHREFFLER,
First Officer, TWA,
Flight 82–30, June 1956.

Mr. HINSHAW. Captain Solomon, if you had flown airways, would there be available a sequence at each stop?

Captain SOLOMON. If I had flown airways?

Mr. HINSHAW. If you had flown airways out of Las Vegas.

Captain SOLOMON. Yes, sir; there would have been a sequence of reports.

Mr. HINSHAW. Was there available to you, and did you obtain in flight, the weather reports ahead of you?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. How did you obtain those?

Captain SOLOMON. At Las Vegas.

Mr. HINSHAW. What about airways radio?

Captain SOLOMON. Well, we have no weather-reporting station anywhere on the Grand Canyon.

Mr. HINSHAW. I said on the airways.

Captain SOLOMON. Well, yes, sir; you can call any airway station, and get the report for that station, or any other station that you want.

Mr. HINSHAW. The current report?

Captain SOLOMON. It is possible, it could be current or it could be an hour old, any time in between.

Mr. HINSHAW. Up to an hour old?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. And the same is true of the point over which you will pass ahead, is it not?

Captain SOLOMON. That is correct.

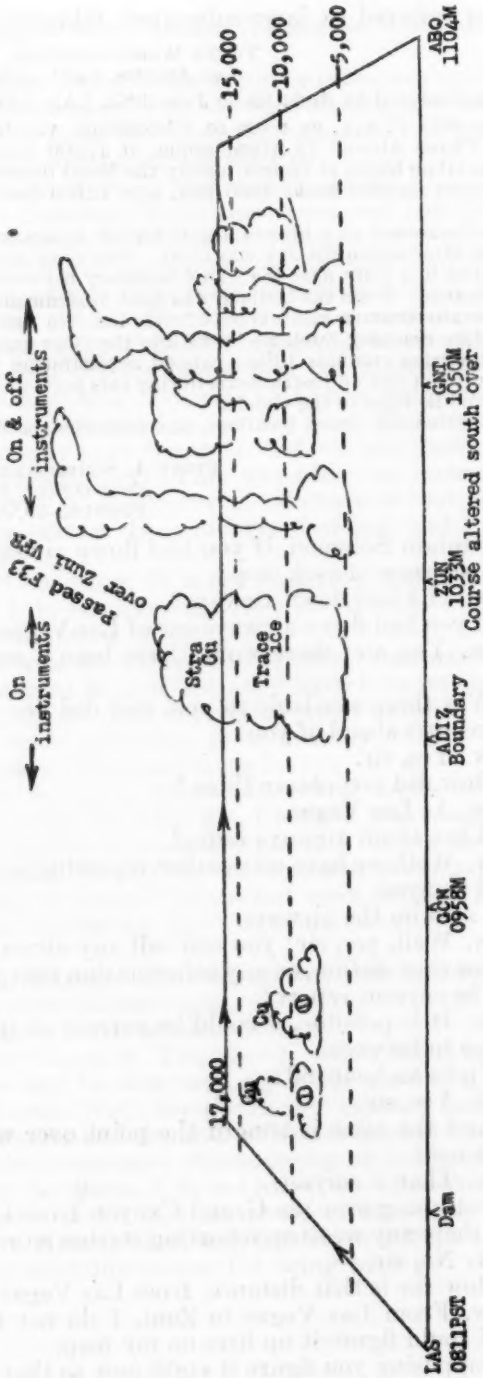
Mr. HINSHAW. But going over the Grand Canyon from Las Vegas to Zuni, N. Mex., is there any weather-reporting station en route?

Captain SOLOMON. No, sir.

Mr. HINSHAW. How far is that distance, from Las Vegas to Zuni?

Captain SOLOMON. From Las Vegas to Zuni, I do not recall the exact mileage, but I could figure it up here on my map.

Mr. HINSHAW. Supposing you figure it right now so that we could know. Not exactly, but in tens of miles.



RESUME OF WEATHER ENCOUNTERED BY FLIGHT 82-30 JUNE,1956, LAS-ABQ

Captain SOLOMON. It is approximately 310 miles. That is nautical miles.

Mr. HINSHAW. And the nearest weather north and south of that direct line would be Winslow and Bryce Canyon, would it not?

Captain SOLOMON. Yes, sir, that is correct.

Mr. HINSHAW. Both of them 75 or 80 miles off the line.

Captain SOLOMON. That is correct.

Mr. HINSHAW. In that territory, to your knowledge, does the weather vary greatly?

Captain SOLOMON. Yes, sir, it varies.

Mr. HINSHAW. Therefore, a report from Winslow or Bryce Canyon, would be entirely inadequate for your purposes in flight?

Captain SOLOMON. Repeat that, sir.

Mr. HINSHAW. Therefore, weather reports from either Winslow or Bryce Canyon could be entirely inadequate for the purposes of your flight.

Captain SOLOMON. It could be. It is possible.

Mr. HINSHAW. Well, is it not, generally?

Captain SOLOMON. Not generally. The stations being quite a distance apart, they could have, and quite often do have, entirely different reports. If the stations were reporting somewhat the same weather, it would give you a general indication of what you could expect in between.

Mr. HINSHAW. As I recall, the Grand Canyon provides for a great many convective clouds, is that not true?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. From thermal conditions.

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. And that the weather over the canyon actually is likely to be more severe than the weather 50 miles on either side?

Captain SOLOMON. Yes, sir, it is very possible, under some conditions.

Mr. HINSHAW. The reason I say that is because of a little experience in flying TWA between Las Vegas and Albuquerque. There were rainstorms over the canyon and on either side there were merely thermals.

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. Is that not a condition which is general in the summertime?

Captain SOLOMON. I would not say it was a general condition, but it does happen. You have your rain showers in the canyon, yes, sir.

Mr. HINSHAW. Is that not frequent?

Captain SOLOMON. In the summertime it is frequent, yes.

Mr. HINSHAW. Well, this accident happened in the summertime, did it not?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. But you have three-hundred-and-some-odd miles over which there is no control and no weather reports.

Captain SOLOMON. That is correct, sir, 310 nautical miles.

Mr. HINSHAW. Now, do you have occasion to see other pilots and other flights during the course of your traversing of that area?

Captain SOLOMON. Yes. If we have weather, we can talk to our own company planes, and we try to keep each other pretty well informed on what each flight is proceeding into, or what we have just left.

Mr. HINSHAW. Do you have any communication with other company planes?

Captain SOLOMON. We do not have a common frequency that we use with them. We can talk to them, if it is necessary, through the CAA airways facilities.

Mr. HINSHAW. If you can raise them, you mean.

Captain SOLOMON. Yes, sir; we could.

Mr. HINSHAW. Can you raise them always?

Captain SOLOMON. Not always.

Mr. HINSHAW. How long would it take you to raise them, ordinarily?

Captain SOLOMON. You have to call the airways radio station and ask them for any information that you might need, and the other company, not our own company, but the other company aircraft may or may not be on the airways frequency. If they are, he can talk to them, and if not, he cannot.

Mr. HINSHAW. What would be the procedure for getting in radio contact, with another aircraft in the vicinity belonging to another company, providing he was not tuned to the airways frequency?

Captain SOLOMON. You could not get in touch with him.

Mr. HINSHAW. There would be no contact whatever, would there?

Captain SOLOMON. Not at that time. I would not say that it would be impossible. There would be a large time element by the time that you could possibly contact your airways, and have airways contact his company, and his company advise him that you wanted to talk to him on the airways frequency.

Mr. HINSHAW. How long would you estimate that would take?

Captain SOLOMON. That would be a variable, sir. It could be anywhere from 1 minute to not getting ahold of him for 10 minutes, perhaps.

Mr. HINSHAW. If the pilot of another aircraft were approaching from the rear and was not visible to your aircraft, would he have any way of getting in touch with you or you with him in that time of approach?

Captain SOLOMON. Not unless you were on the airway frequency.

Mr. HINSHAW. You would have to be, both of you, on the airways frequency; is that not true?

Captain SOLOMON. If he were an opposite company plane; yes, sir.

Mr. HINSHAW. That is correct. Now, do you think that it is desirable or dangerous for pilots crossing an area of this character where there is no airway established and no communications and no weather stations, to have at least one radio tuned to, say, an airways frequency or some other common frequency such as the itinerant frequency?

Captain SOLOMON. I would say it would be very desirable to have a common frequency.

Mr. HINSHAW. Which would you say would be preferable, airways or itinerant?

Captain SOLOMON. I believe that would be an opinion at the moment. I believe a common airways frequency would be more desirable.

Mr. HINSHAW. But there is no common airways frequency, is there, because it would change every so often and you are not on airways?

Captain SOLOMON. Well, you do not have any—you can usually reach an airways station as far as radio contact is concerned.

Mr. HINSHAW. But, to be tuned to a proper frequency, you would have to be in contact with the nearest airways radio; would you not?

Captain SOLOMON. That is correct.

Mr. HINSHAW. And airways radios are not always on the same frequency, are they?

Captain SOLOMON. Yes; you have a common frequency at all stations.

Mr. HINSHAW. For all airways?

Captain SOLOMON. Yes, sir, with all of your VOR stations.

Mr. HINSHAW. That is news to me. That is a common frequency for all VOR stations and I should think you would have great confusion in that case.

Captain SOLOMON. That is a master understatement.

Mr. HINSHAW. Well, now, that is news to me, and I would like to follow that a little bit. Do you mean to tell me that all VOR stations have the same communications frequency?

Captain SOLOMON. They have one common frequency; yes, sir.

Mr. HINSHAW. That certainly lends to confusion in the air; does it not?

Captain SOLOMON. In the extreme.

Mr. HARRIS. In the extreme?

Captain SOLOMON. Well, maybe the statement was a little extreme, but it does lend to confusion. It is not as much confusion as just crowding.

Mr. HINSHAW. Now, can you communicate over the frequency to which you are listening on the VOR?

Captain SOLOMON. Yes, sir; with the airways station, you mean?

Mr. HINSHAW. Yes.

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. Over that frequency?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. VOR frequencies vary from station to station, do they not, until they repeat the pattern?

Captain SOLOMON. Well, the station frequencies, as far as navigational facilities are concerned, vary, but as far as voice facilities they are the same.

Mr. HINSHAW. I asked you if you could communicate over a VOR transmission facility on a VOR signal, similar to the Adcock range. You can communicate over that frequency.

Captain SOLOMON. No, you will have to tune in to the frequency that is the voice frequency.

Mr. HINSHAW. It is a separate voice frequency.

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. Then you said there was a separate voice frequency, identical from station to station.

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. You do not have any chance of changing to an unoccupied or relatively unoccupied frequency, do you?

Captain SOLOMON. No, sir, that would vary with your altitude.

Mr. HINSHAW. As to what? As to the amount of confusion that came in over the radio?

Captain SOLOMON. Yes, sir; that is right.

Mr. HINSHAW. That is all I want to ask at this time.

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Mr. HARRIS. Captain, I would like to go back now to the time you took off at Las Vegas. You received information as to weather conditions to your next stop, in New Mexico.

Captain SOLOMON. Yes, sir; that is correct.

Mr. HARRIS. But you did not get the weather conditions on the route that you actually traveled.

Captain SOLOMON. Not on all of it.

Mr. HARRIS. In other words, you did not receive weather conditions on the part of the route that you were off airways.

Captain SOLOMON. That is correct.

Mr. HARRIS. And you had no information as to what the weather was in that area?

Captain SOLOMON. I had information of the surrounding area at Prescott, Winslow, and Zuni, and Las Vegas, and due to the visibility on approaching Las Vegas, I had some idea of the weather toward the Grand Canyon.

Mr. HARRIS. But you did not have any information as to what the weather conditions were at Grand Canyon.

Captain SOLOMON. I had no reported information.

Mr. HARRIS. That is what I mean.

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Now, you left Las Vegas at 9:30.

Captain SOLOMON. I do not remember the exact time. We were over Grand Canyon at 9:58.

Mr. HARRIS. And how many minutes is it from Las Vegas to Grand Canyon?

Captain SOLOMON. It is approximately 50 minutes, or 55 minutes.

Mr. HARRIS. Well, then, you left about 9 o'clock.

Captain SOLOMON. About 9 o'clock; yes, sir.

Mr. HARRIS. What was the visibility at Las Vegas when you took off?

Captain SOLOMON. It was unlimited.

Mr. HARRIS. Unlimited?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. And then you went VFR.

Captain SOLOMON. We had a VFR climb, sir.

Mr. HARRIS. To 17,000 feet.

Captain SOLOMON. Yes, sir.

Mr. HARRIS. And that was your assigned altitude, had you been on airways.

Captain SOLOMON. Yes, sir; that is correct.

Mr. HARRIS. How long did it take you to climb to 17,000 feet from Las Vegas?

Captain SOLOMON. It took approximately 30 minutes.

Mr. HARRIS. All right, now. Then you had 17,000 altitude, 30 minutes out of Las Vegas.

Captain SOLOMON. Approximately; yes, sir.

Mr. HARRIS. What was your visibility at that point?

Captain SOLOMON. Unlimited.

Mr. HARRIS. No clouds?

Captain SOLOMON. We had a few scattered clouds under us at that point.

Mr. HARRIS. Now, when you got to Grand Canyon, what was your visibility?

Captain SOLOMON. My visibility over the Grand Canyon was also unlimited, except to the east as far as the ADI zone where there was a high cloud condition there.

Mr. HARRIS. Were you 17,000 feet at the time you were over Grand Canyon?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. And you could see the ground?

Captain SOLOMON. I could see the ground east of the Grand Canyon Lodge; yes, sir.

Mr. HARRIS. Could you see the Grand Canyon itself?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. In other words, the weather conditions were not such that it obstructed your view of the Grand Canyon itself.

Captain SOLOMON. Not at that time.

Mr. HARRIS. As a general custom or procedure, did you call to the attention of your passengers that you were flying over Grand Canyon?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Were you over it or at the right or left of the canyon?

Captain SOLOMON. I flew over the Grand Canyon approximately over the lodge on the northern rim, and made a right-hand turn and flew to the south rim, and then proceeded on course from there to Zuni.

Mr. HARRIS. Now, you did that in order to let your passengers see the Grand Canyon?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Is that a general procedure?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Do most of your planes do the same thing so far as you know?

Captain SOLOMON. So far as I know, when they fly over the Grand Canyon, I cannot answer that for sure, but it is up to each individual pilot.

Mr. HARRIS. Yes; I understand. You went to the north. I have a map here. You went to the northern rim, and flew then southeastwardly down the canyon.

Captain SOLOMON. Yes, sir; that is correct. I went to the north rim, and made a right-hand turn and flew across the canyon to the south rim; yes, sir.

Mr. HARRIS. And during that time, which is the usual procedure for the benefit of your passengers, you were calling to their attention that this was the Grand Canyon and you were flying over it and you could see it and whatever statement you usually make in such matters?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. How long have you been flying that route?

Captain SOLOMON. About 14 years.

Mr. HARRIS. You are quite familiar with it.

Captain SOLOMON. About once a week, sir.

Mr. HARRIS. I have a map here, but you do not need it because you have flown over so much and you know that area from A to Z, I am sure. You went to the northern rim of the canyon and turned right; and flew across it, and then back across it and on southeastwardly until you got to the southern rim, as I understand. Did you fly over, or do you recall, or could you identify whether you flew over the exact area where the two planes crashed?

Captain SOLOMON. We crossed after making a right turn, we crossed the south rim approximately over Grand Canyon Lodge.

Mr. HALE. That is where?

Mr. HARRIS. That is where the little airport is, where we were.

Captain SLOMON. That is El Tovar and Bright Angel Lodge there, and it is the only city on the south rim.

Mr. HARRIS. Pardon me.

Captain SOLOMON. It is the only village on the south rim.

Mr. HARRIS. And it is called Grand Canyon and is shown on the map.

Captain SOLOMON. Yes, sir.

Mr. WOLVERTON. How far would that be from where the crash took place?

Captain SOLOMON. Approximately 20 or 25 miles, sir; I would have to measure that.

Mr. WOLVERTON. When you got to Grand Canyon, at Grand Canyon station, did you go back across the canyon?

Captain SOLOMON. No, sir.

Mr. WOLVERTON. You then—when you came across there, you turned then due east?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Then you have just a little of the southern tip of the canyon from that point that you flew over.

Captain SOLOMON. Do you mean the eastern tip, sir?

Mr. HARRIS. Well, it is the southern tip on the eastern side. I will put it that way.

Captain SOLOMON. All right.

Mr. HARRIS. Do you understand what I mean?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. You then flew or your route was just south of where this accident occurred there, according to that description.

Captain SOLOMON. That is correct.

Mr. HARRIS. Now, after you left there, you crossed there. Shortly after that you started due east on your flight, and you crossed the Painted Desert line referred to some 20 miles or 30 miles or something like that from Grand Canyon.

Captain SOLOMON. From where I left the Grand Canyon, you mean?

Mr. HARRIS. Yes.

Captain SOLOMON. Well, it was on a radial of 321° out of Winslow, sir, and I do not know exactly what the mileage would be from where I crossed the rim.

Mr. HARRIS. Are you familiar with where Tuba City is?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Did you fly over Tuba City or do you recall?

Captain SOLOMON. We were to the right of Tuba City.

Mr. HARRIS. Just south?

Captain SOLOMON. Just south, yes, sir.

Mr. HARRIS. Now, how far was it from there to where you entered the ADI zone?

Captain SOLOMON. It is right on your map there, sir. I believe it is indicated by a red line on that map, just east of the 321° radial.

Mr. HARRIS. You crossed into that zone about the time you reached the Painted Desert line.

Captain SOLOMON. Approximately; yes, sir.

Mr. HARRIS. Now, how far is it across the zone?

Captain SOLOMON. Well, that zone encompasses several thousand square miles, sir, around the Albuquerque area.

Mr. HARRIS. But you were still then on visual flight?

Captain SOLOMON. No, sir. When I crossed the zone, you mean? I was visual when I crossed the ADI boundary; yes, sir.

Mr. HARRIS. And then you went to instrument flying after you crossed the boundary zone.

Captain SOLOMON. Yes, sir; that is correct.

Mr. HARRIS. How far?

Captain SOLOMON. I would say 3 to 5 minutes.

Mr. HARRIS. In other words, you ran into weather then.

Captain SOLOMON. Very light weather.

Mr. HARRIS. Very light weather.

Captain SOLOMON. There was no turbulence involved or no storm condition.

Mr. HARRIS. But could you see?

Captain SOLOMON. No, sir.

Mr. HARRIS. That is what I had reference to, you could not see.

Captain SOLOMON. No, sir.

Mr. HARRIS. But up until you reached the zone, your visibility was unlimited and there were just a few scattered clouds.

Captain SOLOMON. Yes, sir; that is correct.

Mr. HARRIS. Now flying over this Grand Canyon area, where the few scattered clouds were, when you would get to a cloud, if it was a sizable cloud, would you try to go around it or would you go on through it?

Captain SOLOMON. I would go around it.

Mr. HARRIS. In other words, while you were flying there you could at all times see as far as your eyes would permit.

Captain SOLOMON. At that time; yes, sir.

Mr. HARRIS. This was about an hour and a half prior to the estimated time of the unfortunate accident?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Captain, with the experience that you have had and the many years that you have flown planes, is there any way that you could tell when another plane might be coming very close to you other than you actually seeing them?

Captain SOLOMON. No, sir.

Mr. HARRIS. If two planes were flying in the same direction, at the same altitude, can you conceive of how one would come in contact with the other, where the visibility was good?

Captain SOLOMON. Well, it is conceivable; yes, sir.

Mr. HARRIS. Is it the policy of the company for sightseeing over scenic spots like this, and other interesting points?

Captain SOLOMON. It is the policy when you fly over them to call the passengers' attention to them, to the fact that you are flying over a scenic spot.

Mr. HARRIS. Is that the policy of most all of the companies insofar as you know?

Captain SOLOMON. Insofar as I know, it is.

Mr. HARRIS. Are there any further questions?

Mr. MACDONALD. You said it was conceivable that planes could hit. Under what circumstances is it conceivable?

Captain SOLOMON. Due to the closure rate of today's aircraft.

Mr. MACDONALD. Would you explain for me what "closure rate" is?

Captain SOLOMON. It is the speed of two aircraft coming toward each other, if you are just using a situation, say you had two aircraft that were each traveling 300 miles per hour, headed toward each other, you would have a closure rate of 600 miles per hour.

Mr. MACDONALD. That is only if they were on a collision course.

Captain SOLOMON. Yes; and head on. That closure rate would vary with different angles.

Mr. HALE. Would the gentleman yield? The question that was put to you, however, as I understood it, was about an overtaking plane.

Mr. HARRIS. Yes, the question was this way, so that there will not be any misunderstanding: "I said, do you conceive of two planes flying in the same direction at the same altitude, of coming together with good weather conditions where each one could see—two planes coming in the same direction, coming together without one seeing the other?"

Mr. HINSHAW. If you will say "approximately the same altitude," why it is a little easier to answer, I am sure.

Mr. HARRIS. Well, I will be glad to have his response to both assumptions.

Captain SOLOMON. Well, all I can say, sir, is just that it is conceivable that it could happen.

Mr. HARRIS. Even if they were flying straight? Of course, if they were banking, one or the other, certainly it would be easy to understand. But if they were flying straight and perhaps one was a little higher than the other, or maybe they were at the same altitude, and coming together. In other words, could a plane, one that is in front of another, could another plane come up behind it sort of like these two pencils are here, and have contact, the front of that plane with the rear of the other plane?

Captain SOLOMON. Well——

Mr. HARRIS. The reason I ask the question, so that you will understand, is that the information that developed when we were out there last week was that there was a dent or a mark on the TWA plane—I believe that is correct—which appeared to be the mark of a propeller, right about the entrance door of the TWA plane, which would be a little to the rear, as I understand it. We do not know and we will never know, but had that been the contact, the other plane would be coming to his right. I was just trying to see if you could conceive how a condition like that developed without one of the pilots knowing that the other plane was there.

I realize it is a tough question and I do not want to try to embarrass you, and I would not at all. I realize a question like that is full of "if" and so forth.

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Now let me ask you this question and see what your reaction would be: Should two planes be coming together, or traveling at that rate of speed, which I believe is about 300 miles per hour or 325 miles per hour——

Captain SOLOMON. Yes, sir.

Mr. HARRIS. If they were going approximately in the same direction, at approximately the same altitude, and one discovers that the other is right on him, I suppose in the twinkling of an eye you would have to maneuver that plane to keep it from hitting, if you got that close.

Captain SOLOMON. There would have to be a fast reaction; yes, sir.

Mr. HARRIS. If they were going both approximately the same direction, then it would be a lot easier to just move the plane slightly one way or the other to avoid it, but if they were to be turning suddenly and flying at that rate of speed, then, of course, it is easy to understand a collision could conceivably have occurred. Would that be a fair statement?

Captain SOLOMON. I think that would be a fair statement; yes, sir.

Mr. HINSHAW. I would like to pose the situation which existed over Palm Springs when an American Air Lines DC–3 had a similar collision with a military aircraft being ferried eastward at that time. The pilot of the military aircraft and the pilot of the DC–3 happened to be personal friends. At that time there was some agreement between them that they would waggle wings or something or other in flight. The military pilot survived the event, and he was able to testify that all of a sudden he realized that he was getting under the 500-foot limit of proximity to another plane, and he banked his plane to get away but when he came out of the bank he found that he was directly on the tail of the American DC–3 and it was impossible for him by any maneuver to keep from sawing off the tail.

Now, I presume that when you say that is conceivable that that is one of the concepts.

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. There may be several others.

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. But it is a case that would not occur once in perhaps 10 million or 100 million times.

Captain SOLOMON. That is correct.

Mr. HINSHAW. In flight.

Captain SOLOMON. That is correct.

Mr. HINSHAW. That is all, Mr. Chairman.

Mr. MACDONALD. I have just one other question. What would you say is the degree of visibility from the cockpit of one of those type planes?

Captain SOLOMON. It varies in the two airplanes. I do not know the exact degree of visibility, forward visibility, that we have. If I may ask a question, we may have that information in our group here. May I consult with these people?

Mr. MACDONALD. Surely.

Captain SOLOMON. In the Constellation, you have approximately a 31° angle of vision forward, and 90° to the side.

Mr. MACDONALD. And was the TWA plane a Constellation?

Captain SOLOMON. Yes, sir.

Mr. MACDONALD. How about the United Air Lines plane?

Captain SOLOMON. I can answer for United.

Mr. MACDONALD. What type of plane was that?

Captain SOLOMON. A DC–7.

Mr. MACDONALD. Do you have any information as to the degree of vision?

Captain SOLOMON. No, sir; I do not have that information.

Mr. MACDONALD. Does TWA not have DC–7's?

Captain SOLOMON. No, sir.

Mr. HARRIS. The TWA plane had a speed of what, about 300 miles per hour?

Captain SOLOMON. I believe this was about 270 knots, 274 knots true airspeed.

Mr. HARRIS. What is the airspeed of the DC–7?

Captain SOLOMON. I believe his airspeed was about 308 knots. I do not know for sure, sir, but I believe it was about 308 knots.

Mr. HARRIS. How long have you been flying, Captain?

Captain SOLOMON. I have been with TWA 14 years.

Mr. HARRIS. Did you fly for someone else before that time?

Captain SOLOMON. I learned to fly in 1939.

Mr. HARRIS. In 1939?

Captain SOLOMON. Yes, sir.

Mr. HARRIS. Is flying so far as airways, and so forth, with regulations and all, about the same as it was in 1939 when you started?

Captain SOLOMON. Just about.

Mr. HARRIS. Do we have the same airways in the country now as we had at that time?

Captain SOLOMON. We have our VOR airways, which we did not have at that time. They approximate the same physical or geographic location.

Mr. HINSHAW. What is the reason why you were given a 17,000-foot altitude to enter at Zuni? Because the weather reports available to you at the time of clearance and takeoff were that cloud conditions intervened?

Captain SOLOMON. No, sir; that was given to me because that was the altitude that I had filed or requested when I left Los Angeles.

Mr. HINSHAW. Why did you pick that altitude?

Captain SOLOMON. Due to the weather reports available to me at that time, and the wind conditions. I felt that would be a very satisfactory ride because we were landing at Albuquerque. That was as high as I wanted to go, and I felt it would give us a good ride.

Mr. HINSHAW. The reason I inquire about that is because, of course, there was some attempt an hour later to get 21,000 feet.

Captain SOLOMON. I did not hear the first part.

Mr. HINSHAW. There was an attempt by both pilots and and successful on the part of one, to get a 21,000-foot altitude.

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. And I wondered why you chose 17,000 feet.

Captain SOLOMON. Well, that was the reason I chose it. I felt—you see, we were making shorter hops than the nonstop flights, and we would spend most of our time climbing and descending if we went to an extremely high altitude with very little time for cruising in between the stop of our climb and the start of our descent. At that time that altitude did give us a very good ride all of the way across.

Mr. HINSHAW. And the tops were what?

Captain SOLOMON. Well, we were on instruments after entering the ADIZ and I do not know what the tops were at that exact position, but before we went onto instruments the tops of the scattered clouds east of Grand Canyon was approximately 12,000 to 15,000 feet.

Mr. HINSHAW. Now, was the fact that there were instrument conditions beyond the ADIZ line known to you before you left Los Angeles?

Captain SOLOMON. We anticipated some buildups around Zuni, N. Mex.

Mr. HINSHAW. And what was the occasion of those buildups? Why did you anticipate them?

Captain SOLOMON. That was our weather forecast.

Mr. HINSHAW. That is what I mean. Was that the weather forecast?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. And did you expect them prior to Zuni?

Captain SOLOMON. I am repeating from memory right now, sir, but I believe we anticipated a very light cloud condition prior to Zuni.

Mr. HINSHAW. What kind of a condition was it that you entered across the ADIZ line?

Captain SOLOMON. Light snow condition, very light snow, just a gradual reduction of visibility.

Mr. HINSHAW. When you came under 3 miles forward visibility you were then forced to go on instruments, or did you go in advance?

Captain SOLOMON. It was a gradual situation. We had our altitude to enter airways, to enter the controlled zone, and so I do not know exactly at what point to say we actually went on instruments.

Mr. HINSHAW. Did the control come across you as you went across the line, or did it wait until you crossed into Zuni? Were you forced to go at altitude on instruments because of the ADIZ or were you required to when you entered the zone?

Captain SOLOMON. We had received this altitude to enter ADIZ at 17,000 feet, and were under radar surveillance. If you do not enter where you say you are going to and at the altitude you say you are going to, the Air Force will make an interception on you.

Mr. HINSHAW. I think it would be profitable to us to have you tell us about that, because that comes very shortly after the site of this accident. Therefore, it is presumed—well, I will not presume anything, but I will ask you—will you give the procedure that you go through upon entering ADIZ?

Captain SOLOMON. Well, that is taken care of in your flight plan when you leave your home station. On this particular occasion we entered ADIZ on a radial of 276° on Zuni. I had a little static, so to speak, with ADIZ on the trip before, and we wanted to make certain that they knew exactly where we were, so that there was no question about our entrance, position, or time in the ADIZ zone.

Mr. HINSHAW. So what did you do?

Captain SOLOMON. We told them exactly what radial we were entering the zone on, and our time of entrance on it.

Mr. HINSHAW. You said you had a little static, and you mean that they had sent a plane aloft?

Captain SOLOMON. They told me that they did, but we never saw one.

Mr. HINSHAW. Now that is a requirement then that you enter ADIZ at your assigned altitude on the flight plan?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. And then you report the radial and the time.

Captain SOLOMON. You do not have to report it. I did it in this case.

Mr. HINSHAW. At that time, when you entered the ADIZ, your position is fixed both by radar and time?

Captain SOLOMON. Yes, sir.

Mr. HINSHAW. That is all.

Mr. HALE. Captain, when you fly over the Grand Canyon and show it to the passengers, do you dip down to get lower altitude, or do you keep on your 17,000 feet or whatever it is?

Captain SOLOMON. Maintain a constant altitude.

Mr. HALE. You never come down to give them a better view?

Captain SOLOMON. No, sir. I personally could not, but I could not answer for anyone else, but I do not think so.

Mr. HALE. Now, on the question of what a pilot can see from his cockpit, if that is what you call it, you say he has 90° on each side, which means he can see anything forward of the beam, as we would say on a vessel, and of course you can see anything coming straight ahead, and you can see 30° up and 30° down.

Captain SOLOMON. We can see about 31° up.

Mr. HALE. You could not see a plane at a 45° angle below, could you?

Captain SOLOMON. I could not answer that exactly, sir, I do not have the exact figures on it, but at a 45-degree angle from the cockpit, it would be difficult, very.

Mr. HALE. You have no means of determining the presence of a plane which is astern or abaft the beam on either side.

Captain SOLOMON. None whatsoever.

Mr. HALE. So far as the overtaken plane is concerned, the only safeguard is the vision which the overtaking pilot has; is that not right?

Captain SOLOMON. That is correct.

Mr. HALE. Now, the newspapers and magazines in the last few days have been full of comments on the restricted visibility of the pilots from the cockpits. Also, I have seen statements made that pilots are so preoccupied with the various dials and indicators and whatnot in the cockpit that they do not look out enough. Have you any comments to make on those criticisms?

Captain SOLOMON. There is plenty in the cockpit to keep you busy, and all of your attention cannot be directed outside.

Mr. HALE. But when you are flying under visual flight conditions in clear weather, is there not somebody who is constantly looking out?

Captain SOLOMON. Yes, sir.

Mr. HALE. Well, can you conceive of a collision occurring in perfectly clear weather, either with an oncoming plane or an overtaking plane?

Captain SOLOMON. With an oncoming plane, it is very conceivable, and with an overtaking plane it is less conceivable.

Mr. HALE. Now, suppose in clear weather, suppose you see a plane coming on a course approximately opposite to yours and at approximately the same altitude, what do you do?

Captain SOLOMON. I move in a hurry.

Mr. HALE. I think that would be a very wise course to pursue, but where do you move?

Captain SOLOMON. Well, the position would be——

Mr. HALE. What I am trying to get at is this: There are definite rules of the road at sea, with two vessels passing each other. Now, is there anything analogous to that in the air?

Captain SOLOMON. If you are overtaking an aircraft, you should pass him on his right, but if you are meeting an aircraft head-on, you

would take whatever action would seem necessary at that particular second.

Mr. HALE. Suppose you decide that you will turn to the right, and he decides that he will turn to the left, and then you are running closer together?

Captain SOLOMON. That is correct.

Mr. HALE. Well, is there no established practice?

Captain SOLOMON. I make a right-hand turn, if you are meeting head-on, you should pull to the right.

Mr. HALE. Well, is that not a definite conventional rule that any pilot would follow?

Captain SOLOMON. Yes, sir.

Mr. HALE. Well, I do not see why there should be a collision.

Captain SOLOMON. At some speeds, sir, you do not have enough time after seeing an aircraft to make a move. Your visual distance is not great enough.

Mr. HALE. I did not hear that last.

Captain SOLOMON. At some of the higher speeds, in your jet speeds, your visual distance is not far enough to turn the aircraft out of the way

Mr. HARRIS. Would the gentleman yield to the gentleman from Massachusetts?

Mr. HALE. Yes.

Mr. MACDONALD. From the figures you just gave, is it conceivable—in answer I would like you to clear up one answer you gave to Mr. Hale. He said 31° of visibility down as well as up. That is not true, is it?

Captain SOLOMON. Just a moment, sir.

Mr. MACDONALD. It is just up, 31°.

Mr. MACDONALD. But you do not have 31° down.

Captain SOLOMON. You do not have any down; that is right.

Mr. MACDONALD. It is just up, 31°.

Captain SOLOMON. Yes, sir.

Mr. MACDONALD. And therefore it is perfectly conceivable, is it not, that if 2 planes were changing altitudes, one coming up at more than 31° underneath a plane, and the other plane just on course, neither would have any possible opportunity of seeing each other, would they?

Captain SOLOMON. It is possible or conceivable to get into a situation where you would have one plane directly over the other and they could fly for hours and never see each other.

Mr. MACDONALD. Even with that very limited degree of 32 and zero.

Captain SOLOMON. That is right.

Mr. MACDONALD. So it would only take that much to cause an accident and it would be nobody's fault, really.

Captain SOLOMON. That is exactly right.

Mr. MACDONALD. As an experienced pilot, what is your opinion about the extension of that visibility from the cockpit? Do you think that would release the pilot from the very burdensome duties he now has when flying visually?

Captain SOLOMON. It is very desirable to have more visibility from the cockpit. Certainly it would not be the complete answer.

Mr. MACDONALD. I understand it would not be the complete answer.

If the design of the plane were changed just a bit, to give you more visibility, it would help, would it not?

Captain SOLOMON. It would be very desirable; yes, sir.

Mr. MACDONALD. In answer to somebody's question, you said that there was somebody looking out the window all of the time. Now, outside of the passengers, who is that?

Captain SOLOMON. Well, either the captain or the copilot.

Mr. MACDONALD. Are there any assigned times when one says, "I will take over the watch," as they do at sea, and the other pays attention to the instruments?

Captain SOLOMON. No.

Mr. MACDONALD. Or is it just sort of haphazard as to who is looking out?

Captain SOLOMON. Both are usually looking out all of the time, except when you are on instrument conditions, or making out your paperwork, or filling out your radio log.

Mr. HINSHAW. Will the gentleman yield? They cannot very well blow whistles in the air, and they do not have the same travel as at sea.

Mr. MACDONALD. I was not drawing any onerous comparison, I was just curious as to cockpit procedure.

Mr. HARRIS. Mr. Hale, do you have any further questions?

Mr. HALE. If I am a passenger in a plane, and I am looking out the window, and I see a plane off here, should I go up and tell the captain about it? Should I tell the pilot?

Captain SOLOMON. Well, sir, the circumstances would be so——

Mr. HALE. Apparently I have a visibility that he has not got.

Captain SOLOMON. That is right.

Mr. HARRIS. That would give him a good opportunity to speak to the stewardness, would it not?

Captain SOLOMON. It certainly would.

Mr. HALE. I must say I would have thought if I did anything like that, that I was being highly officious, but apparently that is what I should do.

Mr. HARRIS. Are there any further questions? I would like to get to Captain Stephan.

Mr. WOLVERTON. I have one question. I assume we have all read a lot of very interesting writing in connection with that accident, mostly by those who do not at times seem to know too much about it. But from the standpoint of interest, I read one article that said that pilots have had many close calls with colliding. Could I ask you if that is so?

Captain SOLOMON. Yes, sir.

Mr. WOLVERTON. Under what circumstances would that be?

Captain SOLOMON. Under probably all circumstances where we do not have positive control.

Mr. WOLVERTON. I read one article, if I read it correctly, that made some reference to a small town close by where this crash took place, as a place where it was necessary for both of these planes to report in, and the only place I see with a very short name and that may have been the one that the article referred to, is Tuba City. Is there any place in the vicinity of where this crash took place, where it is necessary for these planes to report in?

Captain SOLOMON. Yes, sir. At the Painted Desert check point, which is north of Winslow, Ariz.

Mr. WOLVERTON. Well, I have in mind that these planes left Los Angeles only 3 minutes apart, and that they were only supposed by their route plan or whatever technical name you give to them, that they were to fly 1,000 feet apart. Do you know whether that is so or not?

Captain SOLOMON. Sir, I was not on that committee. That was taken care of by the operations committee, and I am not familiar with the operations of those two planes.

Mr. WOLVERTON. You have flown this route—my colleague informs me that that is all in the testimony, and I was not with the committee at the scene of the accident, and therefore I am not familiar with it. I do not have the technical knowledge that some members of this committee have on this particular subject. But it seems to me that starting 2 planes off in the same direction only 3 minutes apart, and flying 1,000 feet apart, could create a condition such as resulted in this crash, particularly if they had to both report in to the same point that you have referred to here in the proximity of the canyon.

Captain SOLOMON. To have planes depart that far apart is not an uncommon thing. It happens all of the time, every day.

Mr. WOLVERTON. Maybe it should be an uncommon thing, that is the point I am trying to bring up. One thousand feet apart does not seem to me to give very much opportunity to change courses, or with the limited vision that you seem to have had as you have stated to us, or because of the weather conditions. I think 1,000 feet is entirely too close. As I said preliminarily, I am not informed on these technical matters. I am just speaking now as a layman. Within 3 minutes of one another and only 1,000 feet apart and the necessity to coverage at a certain point to check in as you term it and so close to where this accident took place—I do not know whether there is any conclusion to be drawn or any thought to be taken as a result of that or not.

I am asking you the question at any rate.

Now I will ask a question further that may or may not—you may wish to answer or the committee may not think it is appropriate to answer. You have flown this district, and you have had a long experience as a pilot. You do not know, of course, all the conditions that created this accident. But with such knowledge as you do have and what you have learned by experience, if you were on the Civil Aeronautics Board or the Administration, what could you say as a practical flying pilot that would be helpful in preventing planes coming together? What do we have now that is inefficient, or what do we not have that would prove efficient in your judgment as a pilot?

Captain SOLOMON. Well, sir, I would like to answer that this way, in saying that the answer to that question would be very long and involved, and that the thoughts that we as pilots have along that line are all concentrated with our headquarters in Chicago.

Mr. WOLVERTON. Do you mean to infer by that, that because they are concentrated in Chicago, that you would not be in a position to express an opinion?

Captain SOLOMON. No, sir.

Mr. WOLVERTON. Well, I would not like to take it from that—I take it that you men who fly the planes day in and day out under different conditions of weather and visibility and everything else that enters into

it are about as good witnesses as I would know to call to give this committee information as to what you think is wrong or that could be corrected that would add to safety.

If that requires too much of your time to answer it as fully as you yould like, I have no objection, if you would write it out and make it a part of your testimony, but I intend so far as I can in these hearings to find out what the pilots have got to say about this. I bank pretty heavily on what the pilots will have to say, and any recommendations they have to make.

Mr. HINSHAW. There is a chairman of the Committee of Pilots present, both of TWA and of United and there is also an accident-investigating committee of the Pilots Association who have studied this accident and also others and they are thoroughly familiar with the rules and regulations. They are available to be called by the committee as I understand it at any time that the committee can hear them.

Mr. WOLVERTON. And I assume that they will be called and I am giving notice by what I have said to this witness and the questions I have asked of him, that it is my intention to find out, if I can, what their recommendations are.

Captain SOLOMON. I would be more than happy to furnish a written report of recommendations from the pilots.

Mr. WOLVERTON. If you have special suggestions to make because of this particular locality, I would like to include those. I am looking for something practical to come out of this, that will be helpful in the future. We only learn lots of times by accidents such as this, unfortunately.

Mr. DOLLINGER. Captain, I understand that the 2 planes in question left 3 minutes apart; is that correct?

Captain SOLOMON. I believe that is correct, sir, but I am not familiar with that transcript of that part of the record.

Mr. DOLLINGER. Am I correct in stating that the first plane that left was the slower of the two, and plane No. 2, the second plane was the fastest plane?

Captain SOLOMON. Yes, sir; that is correct.

Mr. DOLLINGER. Would you say that was poor judgment on the part of the people in charge of the airport to permit that situation to take place, for the faster plane to leave 3 minutes later over approximately the same route?

Captain SOLOMON. No, sir; I do not think so.

Mr. DOLLINGER. If you were in charge of the airport, would you permit such a situation to take place?

Captain SOLOMON. Well, yes, sir.

Mr. DOLLINGER. Who arranges the flight schedules and permits these to take place? Is it the airline itself, or is it the people in charge of the airport?

Captain SOLOMON. That comes out of our traffic department, departure times.

Mr. DOLLINGER. The individual airlines?

Captain SOLOMON. By the individual airlines; yes, sir.

Mr. DOLLINGER. Do the people in charge of the airport have a right to overrule your traffic department in such things, and can they ask for one plane to leave before the other in view of such circumstances?

Captain SOLOMON. I do not know.

Mr. DOLLINGER. That is all.

Mr. HINSHAW. Mr. Dollinger, would you permit me to state that the testimony taken at Las Vegas was that these 2 planes went by different routes to different points, and that the check point was out here in the desert, and that 1 route was by Daggett and Lake Mohave and the other route by Needles, which are many miles apart, 100 miles apart.

Mr. DOLLINGER. Looking at the map, I thought they were too close for comfort and that is the reason I asked that question.

Mr. HINSHAW. They probably were both looking at the Grand Canyon. That is the reason they were too close together.

Mr. DOLLINGER. They should have taken it into consideration.

Mr. HINSHAW. That has nothing to do with it, in my opinion.

Mr. WOLVERTON. How close is this point which has been referred to as a check point for these two planes, to the point where the accident took place?

Captain SOLOMON. I have not measured it on the map, and I could not answer the question exactly.

Mr. WOLVERTON. There are 2 or 3 maps here and if you could do it by looking at it, I would be pleased to have that answer for this reason. Now, it has been testified that they probably went off 3 minutes apart, 1 faster and 1 slower than the other and maybe by different routes, but converging at a check point, and I am anxious to find out how near that check point is to the place where the accident occurred.

Mr. HARRIS. Would the gentleman permit me to help clear this up? It was all developed at the hearing out there and I understand, of course, the gentleman could not be with us, but for the information of both Mr. Dollinger and yourself, the planes left Los Angeles 3 minutes apart. One was flying to the north and 1 to the south, 1 over Daggett and 1 over Needles. They left on flight plans, 1 on instruments at 21,000 feet, and the other one had an original plan for 19,000 feet and therefore they would have been different routes in the air, and 2,000 feet apart. That is altitude.

After the TWA plane left, which was to be on the 19,000-foot route over Daggett, he made a request to go to 21,000 feet. Air traffic control denied the request. The pilot then immediately asked Salt Lake to go 1,000 feet on top.

Captain SOLOMON. The Salt Lake is the control center for that area.

Mr. HARRIS. He was then permitted to go 1,000 feet, on top which was described to us as a minimum of 1,000 feet above the clouds. When he was permitted to go to that altitude, he was advised that United was his traffic. That is what the information developed.

Now, at 21,000 feet, should both planes remain at the altitude and travel according to the flight plan, they would have crossed paths about 100 miles beyond the site of the accident. That is, the accident occurred about 100 miles prior to the point where they would have crossed paths.

Mr. WOLVERTON. Is that 100 miles from the check point to the accident?

Mr. HARRIS. The check point is along a line from Winslow to Bryce Canyon, which are approximately 100 miles, or 150 miles apart; is that right?

Captain SOLOMON. The two towns, yes.

Mr. HINSHAW. I will point out that it is a line of position. At any time that they cross that line, anywhere along that 150 miles, flights are supposed to report. It is not a check point, it is a checkline.

Mr. WOLVERTON. Well, I have been led astray by the fact that reference has been made to a check point. Certainly, in the article that I read, it referred to a check point and it gave the name of it—a very small name. I assume a very small town, because I had never heard of it. But in looking over this map, I see Tuba City which is in the general neighborhood of where the crash was, and I therefore directed my question to you as to whether Tuba City was the location of the check point.

Captain SOLOMON. No, sir; Tuba City is not the location of the check point. The check point is located on this line, which is a 321 degree radial from Winslow, Ariz., and it is 78 nautical miles out from Winslow, Ariz., on this line, and that is known as the Painted Desert check point.

Mr. WOLVERTON. Then this checking could have been done any place along that line? What I am trying to get at is this: We have on the map before us here a point that is marked as the crash site. I am trying to find out how close was the point or the line, whichever is correct, where they were supposed to check in.

Captain SOLOMON. The crash site, where they came in contact with the ground, was approximately 22 miles north of the Painted Desert check point.

Mr. HINSHAW. West, I think it was.

Mr. WOLVERTON. That is the information that I wanted. It indicates that these 2 planes that were leaving Los Angeles 3 minutes apart and either 1,000 or 2,000 feet difference in altitude, were coming together or could come together at a check point 22 miles from where this crash took place; is that right?

Captain SOLOMON. No, sir.

Mr. WOLVERTON. Well, I would be glad to have an explanation of it and I would not take up any more time at the moment.

Mr. HALE. Captain, would it not, in your opinion, be highly desirable if planes could be designed so as to give the pilot a greater range of vision?

Captain SOLOMON. Yes, sir.

Mr. HALE. You have no doubt about that?

Captain SOLOMON. No doubt whatsoever.

Mr. HARRIS. Back to the question that Mr. Wolverton asked you a moment ago, regarding your idea from experience as to what changes should be made of our rules and procedures—airways, safety regulations, and so forth—did I understand your answer to be that your feeling was the same as had been developed and agreed to by your organization or association, which probably you prefer to be described by someone else?

Captain SOLOMON. Yes, sir; I do.

Mr. HARRIS. If you were to file the supplemental statement describing what you thought should be done, you would do so after consultation with your associates?

Captain SOLOMON. That is correct.

Mr. HARRIS. And the recommendation that they have, as you say, centered in Chicago, that would be the one that would be filed?

Captain SOLOMON. That is correct. Those are recommendations that we have all made together.

Mr. HARRIS. As to that, I would like to say to the gentleman from New Jersey, I would prefer that to be presented to us so that we might be in a position to make inquiries about it.

Mr. WOLVERTON. What I want is information, and I would like it in the way in which you speak of it and I would also like it in the words of this pilot who has had this experience in 14 years' flying over this area. Maybe he has some ideas that have not been adopted.

Captain SOLOMON. Sir, what we need is more money and more radio stations and positive control, and bigger airports, better handling facilities.

Mr. ROGERS. Did you mean, Captain Solomon, when you say more money for better control, you mean complete contact between the planes and ground facilities during its flight?

Captain SOLOMON. Positive control; yes, sir. We have radio contact all of the time, and we are never out of radio contact.

Mr. ROGERS. I did not make myself clear. You mean the same as controlled airways at the present time, and in other words, if a plane is cleared for 21,000 feet, he has to fly at 21,000 feet, IFR across the country, whether he is on a controlled airway or whether he gets in what is now an uncontrolled area.

Captain SOLOMON. Yes, sir; he has to fly at that altitude, if that is his clearance.

Mr. ROGERS. If he goes out on IFR rules, he has to abide by IFR rules, until he gets a change to VFR, or whatever happens?

Captain SOLOMON. That is correct.

Mr. HINSHAW. That is a subject of long discussion as to whether VFR and IFR people should be allowed in the same altitude and in the same vicinity. I will argue with the gentleman long and loud on that subject.

Mr. HARRIS. Before we get into that argument, could we proceed further?

Let me thank you for your presentation here today. You can see by this more or less extensive interrogation here the interest in trying to develop something, and I observed also from the press even this morning, the activities of the executive branch. We have observed the last few days the activity of the Department of Commerce. Obviously, there is a lot of interest and effort in many places which, I think, is a pretty good indication that everyone recognizes that something should be done in this field.

It seems to me most unusual that we are operating on the same procedures that we have been operating under for 15 years, and we had slow planes then and we have fast planes now and bigger planes, and they are getting faster and bigger all of the time.

Mr. WOLVERTON. And more of them.

Mr. ROGERS. I would like to make the observation before you let the witness go, I know he has contributed a lot to these hearings and he hails from Wheeler County, in my district.

Mr. HARRIS. Well, we will congratulate both you and Captain Solomon, and Wheeler County, Tex.

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Mr. WOLVERTON. In order that we will have all of the benefit that is possible from Wheeler, Tex., and its representatives, I do not want any misunderstanding. Do you understand that I have asked you to give your personal views with respect to what could or should be done or should not be done with respect to this matter of promoting safety?

Captain SOLOMON. Yes, sir.

Mr. WOLVERTON. All right. I did not want this general report to take precedence over it, not that I discredit the report or discount it or have any reason to question it, but I still feel that a man that flies as often as you do and coming from Wheeler County, Tex., certainly would be able to give us information that would be most worthwhile.

Mr. HARRIS. Who was your copilot with you on this flight, Captain Solomon?

Captain SOLOMON. Mr. Schiffler.

Mr. HARRIS. Thank you very much.

Captain Stephan, may I inquire—we had hoped to get to you this morning, and you were, I believe, the pilot of the American Airlines that flew this route 10 minutes following?

Captain STEPHAN. Approximately 10 minutes; yes, sir.

Do you want me later this afternoon or now?

Mr. HARRIS. I think that we will take a few minutes now for your presentation.

STATEMENT OF CAPT. LIONEL STEPHAN, PILOT FOR AMERICAN AIRLINES

Mr. HARRIS. You are Capt. Lionel Stephan and you are a captain of American Airlines?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. A pilot of that airline?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. What is your address?

Captain STEPHAN. 124 James Avenue, Atherton, Calif.

Mr. HARRIS. On the date of the tragedy, in Grand Canyon, which was June 30, 1956, did you fly a plane from Los Angeles over that area?

Captain STEPHAN. I flew a plane from Oakland or San Francisco to Dallas, passing over that area at 11:36, if I remember rightly.

Mr. HARRIS. Now, suppose, Captain, you just start from the time you left San Francisco——

Mr. FLYNT. Did you say mountain standard time?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. And just give us a description of your flight on that day.

Captain STEPHAN. I would prefer to answer questions, if I could, in that general area, because my flight was from a different area crossing that airway.

Mr. HARRIS. What time did you leave San Francisco?

Captain STEPHAN. Oakland at 8 o'clock, Pacific standard time, and 9 o'clock mountain time.

Mr. HARRIS. We will use mountain time, so that we will all be talking about the same time. You left Oakland flying to Dallas.

Captain STEPHAN. Fresno, Las Vegas, Winslow, Albuquerque, and Dallas.

Mr. HARRIS. All right, now, did you land at Las Vegas?
Captain STEPHAN. No, sir.
Mr. HARRIS. Did you have a nonstop flight from Oakland to Dallas?
Captain STEPHAN. Oakland to Dallas.
Mr. HARRIS. What time were you over Las Vegas?
Captain STEPHAN. 11:06 mountain time.
Mr. HARRIS. Leaving Oakland, you had your flight plan, did you?
Captain STEPHAN. Yes, sir.
Mr. HARRIS. What altitude did you have?
Captain STEPHAN. At 19,000 feet.
Mr. HARRIS. 19,000 feet?
Captain STEPHAN. Yes, sir.
Mr. HARRIS. Were you flying airways?
Captain STEPHAN. Victor visual flight rules.
Mr. HARRIS. All of the way?
Captain STEPHAN. As far as Winslow.
Mr. HARRIS. And after Winslow you went to instrument flight?
Captain STEPHAN. Instrument flight rules to Albuquerque and visual flight rules to Dallas.
Mr. HARRIS. What was your path across this area?
Captain STEPHAN. From Las Vegas, you mean, to Winslow?
Mr. HARRIS. Yes.
Captain STEPHAN. We flew a radial of 74° from Las Vegas to just west of the Grand Canyon Village.
Mr. HARRIS. You were over Las Vegas at 11:06?
Captain STEPHAN. Yes, sir, mountain time.
Mr. HARRIS. Did you report to any station along in that area?
Captain STEPHAN. No; we report directly to Las Vegas.
Mr. HARRIS. That is at 11:06?
Captain STEPHAN. Yes, sir.
Mr. HARRIS. Did you go then directly over Grand Canyon?
Captain STEPHAN. I went south of Grand Canyon Village and I saw the Grand Canyon Airport; that was the only thing I recognized in that area.
Mr. HARRIS. That was at 19,000 feet?
Captain STEPHAN. Yes, sir.
Mr. HARRIS. You maintained your altitude all the way.
Captain STEPHAN. Yes, sir.
Mr. HARRIS. You were over Grand Canyon Airport?
Captain STEPHAN. Yes, sir.
Mr. HARRIS. You could see the Grand Canyon off to your left?
Captain STEPHAN. Not the canyon; no, sir, it was covered over.
Mr. HARRIS. What was the weather condition there?
Captain STEPHAN. Right over the Grand Canyon Village was a large cumulus-type built-up cloud which looked very much like a thunderstorm.
Mr. HARRIS. And this was at what time?
Captain STEPHAN. 11:39.
Mr. HARRIS. How high above this cloud or this condition were you?
Captain STEPHAN. The lower cloud level, I estimate, at that time between 14,000 and 15,000 foot top, but this cumulus cloud that I went around was much higher than we were, probably with a top of the estimated 25,000 feet.

Mr. HARRIS. 25,000 feet?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. And you went around that?

Captain STEPHAN. I went to the south side of it; yes, sir.

Mr. HARRIS. Did you have any information as to weather conditions in that area before you got there?

Captain STEPHAN. Not in the Grand Canyon area; no, sir.

Mr. HARRIS. Now, I see Grand Canyon Airport, and Grand Canyon Station, which is on the south rim of Grand Canyon.

Captain STEPHAN. The airport, I believe, is 12 or 15 miles south of the rim.

Mr. HARRIS. And you flew right over the airport?

Captain STEPHAN. I saw it just momentarily directly below me.

Mr. HARRIS. But the cloud which was some 6,000 or 7,000 feet below you was over the Grand Canyon area itself?

Captain STEPHAN. The thunderstorm or cumulus cloud was directly—we were just probably 2 miles south of the tall, built-up cloud at the time we passed the airport.

Mr. HARRIS. Is that something like a thunderstorm?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. And you would say it was directly over the Grand Canyon?

Captain STEPHAN. It started someplace west of the Grand Canyon Village, and how far east it extended I do not know.

Mr. HARRIS. Well, you are familiar with the location of the crash, the site of the crash?

Captain STEPHAN. I know where the two rivers meet; yes, sir.

Mr. HARRIS. Is that where the cloud was?

Captain STEPHAN. It is possible it extended that far east, but I changed my heading to Winslow at that time and received airways clearance. I believe our heading from Grand Canyon Airport to Winslow was about 110° or 111°.

Mr. HINSHAW. What is the magnetic variation at that area?

Captain STEPHAN. I believe it is 14° or 15°, and of course everything on our charts is set up magnetic and we do not go by true headings.

Mr. HINSHAW. That would be between 14.30° and 15° east, and therefore the magnetic bearing is clocked by 15° approximately.

Captain STEPHAN. Yes, sir.

Mr. WOLVERTON. Would it be appropriate for this witness and the witness who preceded him to make as a part of their testimony the logs on these particular trips which they have been testifying about?

Mr. HARRIS. We are going to have the man who has the logs bring them here.

(The flight plan and log referred to have been placed in the committee file.)

Mr. WOLVERTON. I am not drawing any distinction as to who should present them, but merely that we would have the best possible evidence and that would be the logs rather than memory.

Mr. HARRIS. Do you have the log of your own company; is that right?

Captain STEPHAN. I can get it; yes, sir.

Mr. HARRIS. The American Airlines log.

Captain STEPHAN. Yes, sir. You mean the radio logs or the contacts or what?

Mr. WOLVERTON. I assumed that as you went along on your trip, you made certain notations which I would call the log. That may be with respect to the time you have testified to or it may be something with respect to the clouds that you have referred to, but whatever details will appear on a log that you would make up as a result of the trip you were making. That is what I think would be very appropriate.

Captain STEPHAN. That would be our flight plan, sir.

Mr. WOLVERTON. It is more than a plan, it is what you observed, in a way, and what you did on that particular trip.

Mr. HARRIS. Do you make such a log as you fly?

Captain STEPHAN. You do not keep a running report of the trip, but you put your times down and your estimate of your next check point, and this constitutes the finished flight plan when you turn it in at the end of the trip.

Mr. WOLVERTON. Would it contain any reference to the type of weather you were running into?

Captain STEPHAN. No, sir.

Mr. HINSHAW. May I ask the Captain two questions? First, were you requested, after this accident, to make a special report to anyone concerning the weather conditions at or near the site of the accident?

Captain STEPHAN. Yes, sir.

Mr. HINSHAW. Do you have that weather report or that report with you?

Captain STEPHAN. I made the report to our chief meteorologist at New York, with a carbon copy to the meteorologist at Los Angeles, and it was a teletype message.

Mr. HINSHAW. Do you have a copy of that report with you?

Captain STEPHAN. I think I have in my briefcase.

Mr. HINSHAW. Could you read it?

Mr. HARRIS. I think that we will have to recess at this time.

We will resume at 2 o'clock.

(Whereupon, at 12:30 p. m., a recess was taken until 2 p. m., of this same day.)

AFTER RECESS

(The hearing was resumed at 2 p. m., Representative Flynt presiding.)

Mr. FLYNT. The committee will come to order.

At the time of the recess, shortly after noon, Captain Stephan, I had to leave just prior to the adjournment of the subcommittee. Had you completed your statement, or were you still on the stand?

STATEMENT OF CAPT. LIONEL STEPHAN, PILOT FOR AMERICAN AIRLINES—Resumed

Captain STEPHAN. I was still on the stand, sir.

Mr. FLYNT. Could you give us the last statement that you were asked at the time we recessed?

Captain STEPHAN. I believe Mr. Wolverton asked me for a report, a written report that I turned in to the company on the weather in the area, and I told him I thought I had it in my briefcase, which I had.

Mr. HINSHAW. If you have that report, would you please read it to the committee, and we will place it in the record.

Captain STEPHAN. This was sent to me from our Los Angeles office for a more complete report.

Mr. HINSHAW. Do you have a more complete report that you have turned in?

Captain STEPHAN. No, sir; I received this just before I left. This is marked "Copy of the message filed at Dallas, Tex., on July 1":

Las Vegas, east end of Lake Mead was CAVU. East end of Lake Mead to 20 miles west of the Grand Canyon Junction—

Excuse me, I put "junction," and it should have been "village."

We were on top of scattered clouds at 19,000 feet, with the tops estimated 15,000 feet. We flew south of the town of Grand Canyon Junction or village, and saw the Grand Canyon Airport below us through breaks. One large cumulo-nimbus type build up directly over town of Grand Canyon Junction, and radar indicated several more cumulo-nimbus clouds with active cells to northeast, so we headed straight to Winslow in the clear on top and requested an ATC clearance through the Winslow radio which we received about 8 minutes before reaching the Winslow omnirange.

The rest of this is the report east of Winslow, which is not, I do not believe, particularly pertinent.

Mr. HINSHAW. I believe it is not pertinent.

Mr. FLYNT. It might be well to get it well into the Albuquerque AIDZ.

Captain STEPHAN. That is Winslow omi, the west edge of the field.

Mr. FLYNT. That is it?

Captain STEPHAN. Yes, sir; on the airways. [Reading:]

There were many layers of stratus clouds, with scattered thunderstorms from Winslow to Albuquerque. We had to detour a few miles north of Grants account of active cells over Grants, shown on our radar.

Wait a minute here. Let me see what this is.

Between Grand Canyon Junction Airport and Winslow we were able to see the Colorado River and the Painted Desert area about 70 miles northwest of Winslow through an area of no clouds just west of the frontal area. The ground was wet and several areas indicated recent rainfall.

That is the end of it.

Mr. HINSHAW. You might describe the place that you saw that you mentioned seeing there as the approximate site of the accident, being the junction of the Colorado and the Little Colorado?

Captain STEPHAN. We did not see the area right at the junction. However, I did see the highway that crosses the Little Colorado River right in the vicinity of the town of Cameron and from that town to the city of Winslow was a small area with no clouds at all, high or low.

Mr. HINSHAW. What was the nature of the inquiry to which that was a reply?

Captain STEPHAN. The nature of what, sir?

Mr. HINSHAW. The query by your company.

Captain STEPHAN. They said:

Apparently they want a more complete statement signed by you on file, so will you take care of this at your convenience—

and then they sent me my radio report times and it says:

Report at Las Vegas at 10:06 Pacific, and at 19,000 on top of scattered, estimating Winslow at 57, at 19,000. Proceeding via the Grand Canyon instead of Prescott.

Our flight plan called for Victor 105 airway from Las Vegas to Prescott, where we intended to pick up our ATC clearance. But since the weather seemed to be clear along the canyon, we decided to continue to Winslow, which is the shortest distance direct.

Mr. HINSHAW. I think that you said that you took a course of 74° out of Las Vegas?

Captain STEPHAN. Yes, sir.

Mr. HINSHAW. And at Grand Canyon Junction or City, you turned to 110?

Captain STEPHAN. 110 or 111. I believe that was inbound to Winslow.

Mr. HINSHAW. Do I dare ask you why you took that course instead of making it direct from Las Vegas to Winslow?

Captain STEPHAN. To go over Lake Mead, and as much of the Grand Canyon as we could for the scenic route.

Mr. HINSHAW. That interests the committee very greatly.

Captain STEPHAN. Yes, sir.

Mr. HINSHAW. I take it that it is company policy so far as you know, and also it is not adverse to the pilots' policy to show all points of interest if they are visible en route?

Captain STEPHAN. I try to show the points of interest if they are close to the direct line as possible without detouring.

Mr. HINSHAW. I notice on the airways map I have here that there is marked up but not colored or overlaid with color a civil airway from a place called Grand Canyon which I presume is a marker and an airport, and then south to Winslow. I do not know that that airway has radio aids, does it?

Captain STEPHAN. No, sir; there is no aid at the Grand Canyon Airport.

Mr. HINSHAW. I notice on the rim of the canyon, a place called Grand Canyon, and then about 20 miles south of it an airport called Grand Canyon. Which place are we talking about?

Captain STEPHAN. I passed over Grand Canyon Airport, and that was the point that I saw through a break, but I am speaking of the cumulous-type cloud being over Grand Canyon Village or the town on the south rim.

Mr. HINSHAW. And that is in the nature of 10 or 12 miles north of the airport?

Captain STEPHAN. I think it is 12 or 13 miles north; yes, sir.

Mr. HINSHAW. Is it permissible to fly that airway on a clearance?

Captain STEPHAN. It is not a designated airway, if you mean a colored or victor or numbered airway.

Mr. HINSHAW. It is merely marked as civil airway and not instrument civil airway.

Captain STEPHAN. Well, you fly at high altitude any place.

Mr. HINSHAW. I would assume from what you say that the headings were 74 and approximately 110 and that would keep you on that airway?

Captain STEPHAN. No, sir. 74° heading goes just about over the canyon which is just a little bit north of that. I believe that airway is 79°, and the 74° goes right over the middle of Lake Mead and almost over the middle of the canyon and just north along the north rim, north of Grand Canyon village.

Mr. HINSHAW. At times then, the Grand Canyon would be south of you on your course from Lake Mead, and at times it would be north of you, a matter of 10 or 15 miles?

Captain STEPHAN. Yes, sir.

Mr. HINSHAW. And then at Grand Canyon village where you would come back, it is on your left; is that correct?

Captain STEPHAN. If it is on that particular day, it was on my left, yes, sir; and we are going straight to the Zuni omni, from that area, and when we pass the canyon we head straight for Zuni which I believe is 98°.

Mr. HINSHAW. There would be required for our purposes more map than we have on the desk at this time to determine anything about a bearing to Zuni, but if it was direct, from Las Vegas to Zuni direct, is it 98°?

Captain STEPHAN. No; that will take you direct Las Vegas as to Zuni, south of the Grand Canyon Airport. It shows 84° away from Las Vegas, and 90° into Zuni omni on a direct line, on the chart I have here.

Mr. HINSHAW. What is the radio at Winslow; is that an Adcock 4-course radio?

Captain STEPHAN. It is omni that we use.

Mr. HINSHAW. At Winslow?

Captain STEPHAN. 114.9 megacycles for victor airway. There is a low-frequency range, 266 kilocycles there but we use victor airways.

Mr. DOLLIVER. Captain, am I correct in thinking that your flight across from California to Texas took you on a course which intersected the course of these two planes which collided?

Captain STEPHAN. We crossed the course that they would be flying to Kansas City for Chicago. They were from Los Angeles to the northeast, and we were from San Francisco to the southeast.

Mr. DOLLIVER. Have you had the opportunity to determine the place where these two planes collided in the air? Is that pretty well fixed in your mind?

Captain STEPHAN. I know where the rivers meet there at the Little Colorado and the Big Colorado.

Mr. FLYNT. If the gentleman would yield there, it is approximately the place where both planes hit the ground.

Captain STEPHAN. I just know where the rivers come together.

Mr. DOLLIVER. You were flying at 17,000 feet, as I understand?

Captain STEPHAN. 19,000 feet.

Mr. DOLLIVER. And these other planes were at 21,000?

Captain STEPHAN. I believe that is what the testimony was this morning.

Mr. FLYNT. What altitude were you flying at?

Captain STEPHAN. 19,000.

Mr. DOLLIVER. I do not suppose you have any inkling or any knowledge or any visual information as to these other planes in the air at all; do you?

Captain STEPHAN. No, sir.

Mr. DOLLIVER. You did not know the accident had happened until long afterwards?

Captain STEPHAN. Not until I arrived in Dallas.

Mr. DOLLIVER. And when was that, so we have reference to the time of the accident?

Captain STEPHAN. I believe our arrival in Dallas was 3:55 central standard time. That would be 2:55 mountain time.

Mr. DOLLIVER. What time did the accident happen approximately from your information?

Captain STEPHAN. At 11:30 someone said, I think.

Mr. DOLLIVER. By your calculations, would you have been in fairly close vicinity of the accident at the time it happened?

Captain STEPHAN. No. We passed the airport at 11:39, which is quite a few miles from the scene of the accident.

Mr. DOLLIVER. Beyond the accident?

Captain STEPHAN. Southwest of the accident, it was 9 minutes later and some 30 miles away.

Mr. DOLLIVER. So, obviously, you had no knowledge of what had happened until later?

Captain STEPHAN. No, sir.

Mr. DOLLIVER. Now, did I understand you to say also that at the altitude at which you were flying there was some cloud cover?

Captain STEPHAN. There was a cumulo-nimbus type cloud which is a thunderstorm type cloud with a top higher than we were, which I would estimate at the top of around 25,000 feet.

Mr. DOLLIVER. And you flew around that to the south and west?

Captain STEPHAN. South of the cloud; yes, sir.

Mr. DOLLIVER. Thank you, that is all.

Mr. HINSHAW. Now, Mr. Chairman, I would like to ask Captain Stephan what type of airplane he was flying.

Captain STEPHAN. It was a National DC–6.

Mr. HINSHAW. Then you were on the interchange?

Captain STEPHAN. Interchange flight; yes.

Mr. HINSHAW. And National aircraft are equipped with X-band radar?

Mr. DOLLIVER. What do you mean by interchange?

Mr. HINSHAW. There is an interchange of aircraft between National Airlines and American on a trip from California to Florida by direction and permission of the CAB.

Mr. DOLLIVER. I see. I understand what you mean. I did not get the significance of it.

Mr. HINSHAW. Are the aircraft of American Airlines equipped with radar?

Captain STEPHAN. Our DC–7's, 20 some of the ships have been completed and there is about 6 or 7 that they are working on, and no DC–6's or DC–6–B's have radar as yet.

Mr. HINSHAW. Are any of them yet operational?

Captain STEPHAN. So far as I know, all of the DC–7's that the equipment is installed in are operating at present.

Mr. HINSHAW. How long have they been in operation?

Captain STEPHAN. They started about March or May of this year in installing them.

Mr. HINSHAW. And from your experience flying National aircraft, do you find them of assistance?

Captain STEPHAN. Well, that, sir, was the first time I have been in a National aircraft since November and they were just installing their radar at that time. The interchange goes off in November, and it starts again about the latter part of April.

Mr. HINSHAW. On this particular trip, you said that you saw cells to the northeast of either Grand Canyon Airport or Grand Canyon Village, one or the other, and I presume that you saw those cells on the radar?

Captain STEPHAN. I saw them visually, and you could see them on the radar dimly. The sun was shining in the cockpit and it is like watching the TV looking out the window with a seat sitting in the window.

Mr. HINSHAW. On the other hand, you cannot see a cell, can you visually, except that you might see some precipitation coming out of the bottom of the cloud.

Captain STEPHAN. Visually, you mean?

Mr. HINSHAW. Yes.

Captain STEPHAN. You can see the tall white cumulus clouds.

Mr. HINSHAW. But that is not necessarily a cell until it gets operating?

Captain STEPHAN. That is right.

Mr. HINSHAW. I am just curious about this radar thing.

Captain STEPHAN. On the radar we have a contour switch that when you see these little white spots that you are in doubt about, you can throw this switch to contour and if it make as little black spot in the middle which looks like a lake, it indicates that there is moisture inside the cloud.

Mr. HINSHAW. And you saw some of those on the way through from Winslow on east?

Captain STEPHAN. I turned it on contour once to see if the radar was picking up the canyon wall or the center of these clouds.

Mr. HINSHAW. And what was the answer?

Captain STEPHAN. To me, it looked like cells type clouds and on radar it looks like a bunch of hotdogs with little black marks in them.

Mr. HINSHAW. Are you satisfied with the presentation that this X-band radar makes to the pilot?

Captain STEPHAN. That is my first experience with it, and we detoured thunderstorms between Winslow and Albuquerque by using the X-band and we had no turbulence whatsoever.

Mr. HINSHAW. Then it must be of benefit.

Captain STEPHAN. I did not go through the clouds to know if it was really rough, but we heard reports of hail and heavy rain at Grants after passing there.

Mr. HINSHAW. Then, if I gather correctly, your view of the situation approximate to the scene of this accident, it was clear to the east of a line through the junction of the Little Colorado for some unknown distance, and to the west of the junction of the Little Colorado there were at least three cells?

Captain STEPHAN. Yes, sir. One was west, but the other two seemed to be in the north or northeasterly direction from Grand Canyon Village.

Mr. HINSHAW. Will you describe that accurately again, because I think it is important?

Captain STEPHAN. The cumulus cloud that we went around was almost directly over Grand Canyon Village, and by sight and radar to the north and northeast of that area, there were more cumulus-type clouds built up.

Mr. HARRIS. What kind of clouds?

Captain STEPHAN. Cumulonimbus, and it is an active cloud building.

Mr. HINSHAW. And from the radar?

Captain STEPHAN. The radar also indicated that there was moisture inside of these three clouds.

Mr. HINSHAW. Now, I have one more question. With an IFR clearance at altitude, of course, across territory such as this, uncontrolled, would you normally fly around a cloud which did not have a cell or would you fly through it?

Captain STEPHAN. I would normally fly around it.

Mr. HINSHAW. The reason I think, is obvious, but would you state it for the record?

Captain STEPHAN. The reason I would fly around it is there is turbulence inside of any cloud.

Mr. HINSHAW. But you would fly around it on an IFR clearance?

Captain STEPHAN. Yes, sir.

Mr. HINSHAW. I do not want to put you in the position of these pilots who had this unfortunate accident, and I hope you will not consider in answering the question I am about to ask, that you are in any way placing yourself in that position, because it is not intended. But, if in going around a cloud which happened to be slightly to the right of your flight pattern and being on instruments, that is under an instrument-flight plan, would you feel it necessary still to maintain your 2,000-foot separation from the cloud?

Captain STEPHAN. From the cloud or another airplane?

Mr. HINSHAW. From the cloud.

Captain STEPHAN. Yes, sir.

Mr. HINSHAW. Even though you were on an instrument-flight plan?

Captain STEPHAN. The air could be turbulent pretty close to a cloud just from the amount of air around the cloud.

Mr. HINSHAW. Yes, and I have flown with a good many pilots, and a good many miles, and I have been with them when they nicked the corner of some of these things, quite a few times, through some thin stuff and it did not seem to matter too much if they were on instruments. I suppose that if they were on a VFR flight plan, they would then be subject to VFR rules, but under an IFR flight plan, you can go through it, I believe.

Captain STEPHAN. You could go through it, yes, sir, I presume.

Mr. HINSHAW. You could if there were several ahead of you, you would choose the less likely——

Captain STEPHAN. You mean several clouds ahead of you?

Mr. HINSHAW. Yes, sir, on your pattern, without having to go too far out and around, you could very well go through the corner of one?

Captain STEPHAN. That is possible.

Mr. FLYNT. Will you clarify that point? You say it is possible. Would you probably do it or not?

Captain STEPHAN. I would probably not.

Mr. FLYNT. You would not?

Captain STEPHAN. That is right.

Mr. HINSHAW. That is you personally?

Captain STEPHAN. That is my personal feeling. I do not know, everybody has a different idea.

Mr. HINSHAW. Everybody has a different way of flying, and some fly closer and some fly less close and sometimes when you are supposed

to be on top, you are not quite, for all purposes, and sometimes when you are supposed to be in the soup, you sometimes break out and go in again. It depends on the altitude assigned; is that right?

Captain STEPHAN. If I am on an instrument flight plan, I try to adhere to the airways as close as possible, and when I am on a VFR flight plan, I stay as far away from the instrument conditions as possible, or circle until I get an instrument clearance.

Mr. HINSHAW. I do not want to embarrass you, but if you are competent to give your answer, give it; or do not give it if you are not. If it is the policy of your company that when a pilot flies on an instrument flight plan he must fly airways or not fly airways?

Captain STEPHAN. No, you can take an instrument flight plan and fly off airways in VFR conditions.

Mr. HINSHAW. Is there any stated policy in that respect that you know in the manual for American Airlines?

Captain STEPHAN. Yes, sir; it states that you shall remain VFR off airways.

Mr. HINSHAW. And by VFR do they mean that you can go around clouds and remain VFR?

Captain STEPHAN. You would have to go around them to remain VFR.

Mr. HINSHAW. You can vary your course, in other words, to remain VFR?

Captain STEPHAN. Yes, sir.

Mr. ROGERS. You mean that if you had an IFR clearance, but you went off of airways that you would have to go off on VFR even though you were on an IFR clearance, and that you would not fly IFR off the airways?

Captain STEPHAN. Yes, sir; we fly IFR flight plans on a direct routing so we will have protection in our climb to our cruising altitude where we leave the airway and also where we enter the next airway to make our descent.

Mr. ROGERS. But so far as your IFR is concerned, you said a minute ago that if you were on VFR and you came to a cloud you would circle until you got an IFR clearance. Did you refer to a cloud on an airway or off an airway?

Captain STEPHAN. Just any type of a cloud. I mean a frontal area that you would have to fly on instruments and just going around a cloud would not be circling.

Mr. ROGERS. What I mean is this: You are talking about your airway route, and an airway you would have to fly through. If you were off a controlled airway, and you had IFR clearance, and came to a front, what would you suggest?

Captain STEPHAN. I would have to go to the nearest airway and pick up a clearance on that airway and proceed in VFR conditions to that airway.

Mr. ROGERS. Thank you.

Mr. HINSHAW. How long after the TWA flight 2 checked Vegas did you check it?

Captain STEPHAN. I believe I understood he took off at Las Vegas and made his climb—you are talking about flight 2. Which one are we speaking of?

Mr. HINSHAW. TWA flight 2.

Captain STEPHAN. You mean Solomon? I did not know flight 2 checked Vegas.

Mr. HINSHAW. It went across Lake Mohave. How long after it checked Lake Mohave did you check at Vegas?

Captain STEPHAN. I do not have those times, sir. I believe it was 11:06 over Las Vegas.

Mr. FLYNT. It was estimated at Lake Mohave at 10:55, and reported Lake Mohave 10:55.

Mr. HINSHAW. You checked Las Vegas when?

Captain STEPHAN. 11:06.

Mr. HINSHAW. It is 11 minutes later, and there is no reason why TWA, too, should have been given your flight as traffic or you given it as traffic, is there?

Captain STEPHAN. Well, I was on VFR flight plan, and they give no traffic at all to us. Airways, I do not believe, gives traffic any more unless it is pertinent traffic.

Mr. HINSHAW. Do you have any comments about flying up and down the Grand Canyon with a load of passengers VFR under scattered conditions where they are cumulo-nimbus occasionally, and apparently plenty of traffic in the area approximately the same altitude?

Captain STEPHAN. Well, we try to look out as much as possible, both directions for crossing traffic, because the Los Angeles traffic crosses at that point.

Mr. HINSHAW. When we say as much as possible, this was not possible.

Captain STEPHAN. Apparently not.

Mr. HINSHAW. That is all, Mr. Chairman.

Mr. HARRIS. Are there any other questions?

Mr. FLYNT. Captain Stephan, I want to go back to what you said a few minutes ago about your crossing the Grand Canyon airstrip, as distinguished from Grand Canyon village.

Captain STEPHAN. The little airport; yes, sir.

Mr. FLYNT. Now, you flew almost directly over that?

Captain STEPHAN. Yes, sir.

Mr. FLYNT. Now, were you flying approximately southeast at that time?

Captain STEPHAN. Yes, sir; we were on the 111° radial on Winslow at that time, which would be a southeasterly direction.

Mr. FLYNT. And the clouds that you said obscured your view, were those clouds hanging over the area of Grand Canyon village?

Captain STEPHAN. Yes, sir.

Mr. FLYNT. Did those same clouds, or clouds in the same general vicinity, obscure your vision of the junction of the Little Colorado and the Big Colorado Rivers?

Captain STEPHAN. The clouds sloped down from the top in a sloping manner, which spread out at the bottom like a mushroom to that area.

Mr. FLYNT. What would you estimate the top of those clouds that you saw to be?

Captain STEPHAN. The high cumulus, you mean, over the Grand Canyon Village?

Mr. FLYNT. Yes.

Captain STEPHAN. I would estimate about 25,000 feet.

Mr. FLYNT. They were above you?

Captain STEPHAN. Yes, sir; well above us.

Mr. FLYNT. You were still about 19,000 feet?

Captain STEPHAN. Yes, sir.

Mr. FLYNT. And they were approximately 25,000 feet, the top of the cloud columns?

Captain STEPHAN. Yes, sir.

Mr. FLYNT. Were those columns that you say the top was about 20,000 estimated—would that be the top of the columns or the top of a stratus?

Captain STEPHAN. The top of the columns.

Mr. FLYNT. I have no further questions at this time.

Mr. HARRIS. Well, Captain, how low were the bottoms of the clouds?

Captain STEPHAN. We could not tell that, sir. The tops looked to be about 15,000, and we could not tell what the bottoms were.

Mr. HARRIS. You mean the top looked to be about 15,000?

Captain STEPHAN. Yes, sir; that is the top of the stratus, which this one cumulo-nimbus was sticking up there, because we went on top of clouds some 20 or 30 miles west of the junction or the Grand Canyon village.

Mr. HARRIS. Do I understand your description of this cloud over Grand Canyon? It was one big cloud over the canyon, and it had these two cumulo-nimbus sticking up from them?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. Is that the way you described it? I am sorry I was late getting here.

Captain STEPHAN. There was a large area on down to Flagstaff that this low stratus covered but these cumulo-nimbus clouds started right at Grand Canyon village and were to the north or northeast of there.

Mr. HARRIS. Now, the big cloud that they came out of was covering that whole area over the Grand Canyon?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. And you of course do not know how thick that was?

Captain STEPHAN. No.

Mr. HARRIS. What was the top of the cloud mass?

Captain STEPHAN. I estimated 15,000 feet.

Mr. HARRIS. And you were at 19,000 feet?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. You were about 4,000 feet from you to the base of this?

Captain STEPHAN. I did see Mount Humphrey on the way to Winslow, but it was down in a low place in the clouds, and on top of Mount Humphrey that is a little under 15,000 feet.

Mr. HARRIS. Could you tell by your radar how big that cloud was, the base of it and how much area it covered?

Captain STEPHAN. The radar does not show that.

Mr. HARRIS. And of course, there was so much of it and it was so big you could not tell by looking at it how big it was?

Captain STEPHAN. I was not too interested in this cloud. The main thing we were doing was just staying south of it and trying to figure out if we would penetrate the Albuquerque ADIZ at the time we estimated at 27, and we reestimated or checked on our omni bearings and found out our estimate was about right, and so we did not change it. If you are going to be over your altitude, changing the altitude or the time of penetration, you have to reestimate the station ahead.

Mr. HARRIS. Well, Captain, there would be no particular reason for a plane flying 21,000 feet to fly right over that area at that time, would there?

Mr. STEPHAN. I do not know what his reason was for going to that altitude, or when he went up there.

Mr. HARRIS. Assuming that it was 21,000—and we do not know that it was—it would be 2,000 feet higher than you were, right over the area, and there would be no way to see down through that mass of clouds, could they?

Captain STEPHAN. I do not think that you could see down through anything at the area I passed over.

Mr. HARRIS. That is what I am talking about. The cloud as big as that, and the weather conditions there, could not move very far in the course of 6 minutes, could it?

Captain STEPHAN. No; it would not move very far.

Mr. HARRIS. From your experience do you observe that clouds move in often quickly like this?

Captain STEPHAN. The cumulo-nimbus type clouds build up pretty fact when the sun is on them and in the heat of the day.

Mr. HARRIS. They come from below or do they move in from some other place?

Captain STEPHAN. Both ways, sir. They move in and build up both——

Mr. HARRIS. Do you have any suggestions as to how the rules or procedures might be amended to improve safety in the air?

Captain STEPHAN. I would like to think that one over, and sit down and write it out on paper before I made a statement to that effect.

Mr. HARRIS. Will you do that for us?

Captain STEPHAN. Yes, sir.

Mr. HARRIS. With the years of experience you have had, I should think it would be very helpful. In fact, I would give great weight to the views of you people who are actually flying and have over the years. It seems to me that you should be in a position to offer some very good suggestions.

Captain STEPHAN. I will try it.

Mr. HARRIS. Are there any further questions?

Mr. WILLIAMS. Captain, I am sorry that I did not hear all of your testimony about the weather conditions at the time you went over the canyon. I understand that you passed over this area 5 or 10 minutes after these other planes were due there?

Captain STEPHAN. We were south of the area.

Mr. WILLIAMS. You said there were buildups in that area. Were they in the process of building up or had they reached full-blown proportions?

Captain STEPHAN. I would guess that they were still building at noon, knowing the way a cloud builds, until late afternoon.

Mr. WILLIAMS. This question may have already been asked—I do not know—but I will ask it again: Were these buildups very numerous to the extent you had to fly in and out of them, or were they more or less isolated?

Captain STEPHAN. On the track we were on, we flew south of the one of interest to me which was directly ahead of me at the time I reached the area.

Mr. WILLIAMS. There was one particularly bad one in the area.

Captain STEPHAN. There was one right square in front of me as I approached Grand Canyon Village.

Mr. WILLIAMS. That is all I have. I understand from some of the other members that you said the tops reached up around 25 or 26 thousand feet?

Captain STEPHAN. I estimated 25,000 feet; yes, sir.

Mr. ROGERS. How far off your course or your direct course that you were on did you have to fly to go around the south part of that cloud, the south end of it?

Captain STEPHAN. Well, it was not a direct course, we flew a dogleg to the Grand Canyon Village and at that particular time we were on the radial heading to Winslow, that we would fly to enter an airway.

Mr. ROGERS. Now, how much further south did you go, estimated in miles, than you would have if you had not had to go around that south end of that cloud?

Captain STEPHAN. If we had gone straight ahead we would have gone over the north rim of the canyon, and we passed over the little airport which is 12 miles, I believe, south.

Mr. ROGERS. That is the point I wanted. Thank you.

Mr. HARRIS. Captain, thank you very much. We appreciate having your statement and we will be glad to receive a further comment in response to the question I asked you.

Mr. FLYNT. Captain Stephan, when you see a cloud directly in front of you, is it customary to go around the right of it, the left of it or does it make any difference?

Captain STEPHAN. It is customary to figure out which is the shortest way to go around these clouds.

Mr. FLYNT. And you go either to the right or to the left.

Captain STEPHAN. That is correct.

Mr. FLYNT. But you generally try to stay at least 2,000 feet from it on one side or the other.

Captain STEPHAN. Yes, sir.

Mr. FLYNT. Do the regulations prescribe 2,000 feet?

Captain STEPHAN. Yes, sir.

Mr. MACK. Captain, perhaps you have already stated this, but I was wondering what kind of a flight plan you were on.

Captain STEPHAN. VFR flight plan as far as Winslow and instrument flight plan to Albuquerque, and VFR to Dallas.

Mr. MACK. You had an altitude assignment then?

Captain STEPHAN. From Winslow to Albuquerque, 19,000 feet, with an altitude assigned.

Mr. MACK. Thank you very much.

STATEMENT OF J. A. BROWN, A METEOROLOGIST

Mr. HARRIS. What is your name?

Mr. BROWN. J. A. Brown, sir.

Mr. HARRIS. Are you the meteorologist?

Mr. BROWN. Yes, sir.

Mr. HARRIS. Did I understand you did not bring your reports with you?

Mr. BROWN. That is correct, sir.

Mr. HARRIS. You do not have anything with you?

Mr. BROWN. No. I was in town on other business.

Mr. HARRIS. How long are you going to be in town on other business?

Mr. BROWN. I am leaving tonight at 5:15.

Mr. HARRIS. Very well.

Mr. Sayen is the next witness.

STATEMENT OF C. N. SAYEN, PRESIDENT, AIR LINE PILOTS ASSOCIATION, CHICAGO, ILL.—Resumed

Mr. HARRIS. As president of the Air Line Pilots Association, I understand that you are in a position to answer the question Mr. Wolverton asked Captain Solomon this morning. Are you prepared to do that now, or would you want some more time to think about it?

Mr. SAYEN. I think we are on record before a number of congressional committees and other agencies of the Government on various recommendations for the improvement of the air traffic control situation. We have convened on Monday of next week another meeting of our air traffic control committee, which is a 12-man committee of active pilots who have been working on this problem for quite some time, to meet with both of these accident investigating committees to consolidate our thinking and our reports and our recommendations and we will have further recommendations at that time.

But we are on record consistently urging improvements in the overall air traffic control situation in this country.

We were of course, most encouraged at the action of the executive branch of the Government in urging this additional appropriation of $68 million to be added to the $40 million previously appropriated to modernize and bring up to date and improve air traffic control facilities, navigational facilities and we very sincerly hope that at least that amount will be appropriated before this Congress adjourns.

It is badly needed for improvements. Some of those things, if you want to go into them briefly, are that we need, we think, positive control of air traffic, especially en route air traffic just as rapidly as possible. Now, the 5-year plan that has been advocated by the Civil Aeronautics Administration, and too, they have sought funds from this session, envisages positive control of all en route air traffic above 24,000 feet.

Mr. DOLLIVER. Will you define positive control?

Mr. SAYEN. Control other than by visual means, that is control from the ground generally, where you are assigned a piece of airspace and then protected in it by not letting other traffic into that piece of airspace.

Mr. DOLLIVER. That would be by means of electronic communication, of one kind or another?

Mr. SAYEN. Or radar.

Now, we have criticized the program of the Administration which is a 5-year program as being much too conservative, and that the program should be accelerated and the facilities installed just as rapidly as can be planned and accomplished.

Now, I understand that the Administration has revised its program in recent days, and now envisages that this program can be completed in 3 years or less. If the additional appropriations can be made, that is so.

Mr. HINSHAW. I might go back of that a little ways, and point out that the RTCA special committee 31 made a report and a request for funds and has continually done so since 1948. So let us not talk about the Administration did that or that, it is the administrations, plural.

Mr. SAYEN. We have had a situation where appropriations for air-traffic-control development and CAA generally have been decreasing since about 1950 while aircraft movements in this country both in numbers and in complexity have increased quite largely.

Mr. HINSHAW. Now, Mr. Sayen, let us go a little bit further, and point out that this Committee on Interstate and Foreign Commerce and, I believe the Senate committee, also passed out and it became a public law, a bill for prototype testing some many years ago, 6, 7 or 8 years ago, which has expired now. That was for the purpose of keeping ahead of the use of jet aircraft, and we knew that at that time and everybody else knew it at that time except the appropriative functions and the Bureau of the Budget as they have gone along and also in the Congress; is that not correct?

Mr. SAYEN. I agree with you.

Mr. HINSHAW. We were trying to anticipate the jet age.

Mr. SAYEN. That is right.

Mr. HINSHAW. And the support has only come from the legislative and top executive spots in the Government.

Mr. SAYEN. That is right. We have supported that legislation at that time and we felt it was vital, 8 years ago, but support for it did not come, and it looks like it is just beginning to come now.

Mr. HINSHAW. Now, I want to point out also that a request has come through to pass a bill this session extending the prototype legislation. I should have mentioned this to my friend earlier, because somebody else has it apparently. We should pass that at this session by unanimous consent. I am thoroughly convinced of that, because there ought to be an appropriative function commencing through the Department on an authorization before next winter.

Mr. SAYEN. We are badly in need of a modernization and improvement of the entire system of air-traffic control. We need personnel changes which are going to require some concurrence, I understand, of the Civil Service Commission. At the present time, controllers are paid as adequately for serving in areas that have a very small number of aircraft movements as they are for serving in the congested areas. The result is a loss of important personnel from important areas. There has been a loss of personnel generally in traffic control and it has been difficult to keep and train people. I understand there is a program underway now trying to alleviate some of that situation.

Mr. ROGERS. Will the gentleman yield at that point? You said personnel changes. Do you mean an increase in personnel, or that some of the personnel now acting are not qualified for the jobs they are doing?

Mr. SAYEN. In some instances, there has been a need for an increase in personnel, and in some centers where the traffic has developed very rapidly, they have not been able to recruit and train personnel fast

enough to have the level of experience that the people there desired to do the job. The result is that some of the controllers have had to work long hours, and that sort of situation has existed.

Also, in the areas of the greatest congestion and complexity of traffic control, they have lost some of their most experienced people either to other jobs or to less congested areas and, as a result, had to use people of lesser experience.

I think steps can be taken to alter that situation.

Mr. HINSHAW. Has your organization kept abreast of the number of traffic movements in the various localities?

Mr. SAYEN. Yes, sir.

Mr. HINSHAW. And by what percentage have those traffic movements generally increased over the past 5 years?

Mr. SAYEN. I do not have the figures with me, but I believe we have had an increase of 3 million movements per year since 1951. I would want to check those figures; that is from memory.

Mr. HINSHAW. Having nothing to relate the 3 million to, we do not know whether it is a big increase or a small increase. If we could relate it to the number of increases of the previous year, then we could relate it.

Mr. SAYEN. It is a large percentage increase, and I do not want to name a precise figure. It is a large percentage increase, but the increase in movements has to be coupled with the increase in complexity due to the varying speeds of aircraft. We have aircraft moving in our traffic-control system now with speeds all of the way from 100 miles an hour to 600 or 700 miles an hour, something we did not have 5 or 7 years ago.

That complicates the allocation of airspace a great deal. We are still working on a system of time separation, and we allow 10 minutes, and 10 minutes in an airplane moving at 150 miles an hour is 25 miles of airspace, and 10 miles in an airplane moving 60 miles an hour is 60 miles of airspace.

There is vertical separation and time separations on the airways. We are still using strictly an airways system except for the off-airways flying in uncontrolled areas such as the situation that you have heard described here today. That tends to sieve on your traffic into narrow airways and with more precise methods of navigation it tends to sieve on your traffic even more into what could be collision courses.

With the installation of additional radar of the surveillance type, and long-distance radar, we would be able to control traffic on an area basis, once again and still provide control and also we may be able to do away with quite a bit of the time spacing. Therefore, we can move traffic more expeditiously.

There are other things that are vital to air-traffic control that have been agreed upon for a good many years and can be installed. The bottleneck of course, in an airways system, are the airports themselves. Once you move airplanes from point A to point B, you have to get them out of the air to relieve the congestion, and you need a system to do that to have navigational devices, setting up approaches, and you need approach lights and better runway lighting and in some cases to increase the rate of acceptance you need multiple runways on the airports, and you need multiple-approach systems from more than one direction.

Mr. HINSHAW. And, multiple airports.

Mr. SAYEN. Yes, integrated into this system, so that traffic will flow into the system without interfering with each other.

Most of these things are not development items. They are items which are available and have been available for some time, and can be installed with the necessary appropriations.

Mr. HARRIS. Are they contemplated in the so-called 5-year plan that has been announced?

Mr. SAYEN. Yes. But by the end of the 5-year plan unless there is continual research and development, we think that we will be again behind the traffic problem. That is why we have strongly urged that the 5-year plan be expedited and that the improvements contemplated in the 5-year plan be compressed at least into a 5-year program or sooner.

Mr. DOLLIVER. Well, of course, you cannot do all of these things at once. You cannot pass a miracle and bring these things into existence. They have to be manufactured and installed; do they not? And, personnel trained to operate them.

Mr. SAYEN. That is true, but it is a matter of programing and I think that technical people will indicate that given the proper funds it could be programed and installed in less than a 5-year period, much less than a 5-year period.

Mr. DOLLIVER. I would like you to develop the thought that you just expressed, namely, that you fear that by the end of the 5-year plan, the plan that is now contemplated will already be obsolete. What future improvements are there? Maybe we need to improve the so-called 5-year plan.

Mr. SAYEN. Well, it is a matter of continual research and there is a great deal of opinion that traffic controls will eventually have to come to be more of an automatic function than it presently is. In other words, if we want to develop this whole thing, I am certain some of the committee members are familiar with it, that we are going to probably eventually do away with communications as a means of traffic control.

Right now communications are largely on a relay basis, and the pilot calls his company radio and the company radio calls the ATC, and the ATC calls back the company radio and they relay it to the pilot and it is much too slow with the present speeds of airplanes. We have sought communications when the pilot talks directly to the controller, and not just to the control center but to the controller who is actually controlling his flight, so that he can get changes in his flight program or clearances in less time than he is now getting.

We call it direct communications.

Now, there is a good deal of research going into the fact that if we had enough traffic and airplanes move fast enough, we have to do away with communications entirely, and just have automatic devices in the aircraft which show whether you have a clear channel, or you do not have a clear channel. That type of research——

Mr. DOLLIVER. You say some such thing will have to be developed. I take it from that statement that presently they are not developed and would require some research and engineering to get them ready for use.

Mr. SAYEN. Yes, sir.

Mr. DOLLIVER. How long a period of time would you estimate that would take?

Mr. SAYEN. Well, it would be an estimate at best, but some of the techniques for developing such devices and some of the research has been completed. We have, of course, this program that has been set up by the President with General Curtis to attempt to make recommendations as to the long-run traffic problem. In looking at it into the future, we are trying to have a definite plan. Some of the planning has been done by the RTCA, and by the Air Navigation Development Board and other groups working on this problem. It is not completely without plan and research. There has been some work done on it.

Mr. DOLLIVER. Do you think that the presently developed controversy between the VOR–DME system, and the tactical air navigation system has any bearing on this problem?

Mr. SAYEN. At any time you have a dispute and the dispute lasts over a period of time, it will delay the installation of the devices that are available. I have been assured today that there is going to be a decision in the VOR and DME and TACAN methods by the end of August.

Mr. DOLLIVER. By whom?

Mr. SAYEN. By the air coordinating committee, I guess.

Mr. HARRIS. If the gentleman will yield right there, I do not want to pour cold water on any encouragement that you might have had, but I have been assured that that was going to take place every 2 weeks since about the 1st of May.

Mr. DOLLIVER. As a matter of fact, this controversy existing in that area has had a tendency to retard and prevent the planning or the development of the plan about which we are talking. Is that not the result of a sort of a stalemate that has come about because at least some people are not satisfied as to the effectiveness of the tactical air navigation system?

Mr. SAYEN. That is true. That is true in many areas. I think the best statement that I could make on it is that if we are going to wait for utopia in an air-traffic control system before we do anything to improve the system we have by the installation of already known and accepted methods of improvements, it is going to take continual research and development to keep the air-traffic-control system which is a responsibility assumed by the Government, to keep that up with technological development in the aviation industry, both military and civil.

There is not any doubt that these disputes are there, and we have had this approach light dispute for many years, and we need them badly, but we have had disputes as to the proper system, and we have had some areas of dispute on it, and, of course, it has delayed installation of much-needed approach lights.

Mr. DOLLIVER. In other words, what you are saying is that we ought to use the advanced techniques that are now available and agreed upon to the fullest extent possible, and in your opinion that has not been done?

Mr. SAYEN. That is right.

Mr. DOLLIVER. There is a time limitation here so I will withhold any further questions.

Mr. HARRIS. Thank you a great deal.

Mr. SAYEN. We would be very happy, if the committee, desires, to submit to you formal recommendations in writing following our sessions that are going to be held next week, and elaborate on this then if you desire.

Mr. HARRIS. Could you do that by the latter part of next week?

Mr. SAYEN. I believe we could.

Mr. HARRIS. If you will, we will appreciate it a lot.

Mr. SAYEN. Thank you, very much.

(The information referred to, later submitted by Mr. Sayen, is as follows:)

AIR LINE PILOTS ASSOCIATION,
Chicago, Ill., November 20, 1956.

HON. OREN HARRIS,
Chairman, Subcommittee on Transportation and Communications of the House Interstate and Foreign Commerce Committee, House of Representatives, Washington, D. C.

DEAR MR. HARRIS: When representatives of this association appeared before your committee several months ago to introduce testimony relative to air-safety matters and more particularly the current problem of improving our air-traffic control procedures, we indicated that we would furnish you with some specific recommendations with respect to the foregoing problems.

We have now had an opportunity to review this matter with our technical groups and our membership: First, we would like to restate our position with respect to certain Government organizational changes which we feel would be desirable to expedite a solution to these problems and assure that the governmental agencies charged with the responsibility of developing and regulating the airline industry will be better able to fulfill their obligations. It is still our opinion that the Civil Aeronautics Administration should be responsible for continuous, immediate, and long-range planning to solve these problems and secure adequate appropriations necessary to cope with current and future problems in this dynamic industry. Further, we note with increasing alarm the influence being exerted by our military departments in the establishment of policy for civil aviation. This influence is, of course, very marked in the Air Coordinating Committee.

With respect to the immediate air-traffic control problem, we have the following 10 recommendations which should be given careful consideration and implemented as rapidly as conditions will permit:

1. We recommend that immediate steps be taken to provide positive air-traffic control under instrument flight rule conditions on all routes currently being utilized by the air carriers and military forces.

Under present heavy traffic conditions, and due to the lack of alternate routing, there are routes currently being flown under instrument flight rule conditions where no traffic control is provided by the Civil Aeronautics Administration. Immediate steps should be taken by the CAA to provide adequate navigational aids in these areas and assume the obligation for providing positive traffic control.

2. We recommend the elimination of the 1,000 feet on-top clearances and the use of instrument flight rules above 9,500 feet mean sea level east of 100° meridian and 14,500 feet mean sea level west of 100° meridian.

As a practical matter, the old see-and-be-seen philosophy in connection with avoiding other aircraft is now obsolete. At present, the speeds of modern aircraft induce a closure rate beyond the capacity of the human sight. This factor coupled with the lack of adequate visibility from the cockpit and increased traffic make it imperative that positive control be established as rapidly as possible. It is believed that the ultimate solution will probably be the elimination of all uncontrolled traffic in the areas utilized by our larger and faster aircraft. The immediate introduction of control above the levels indicated would provide us with a greater safety tolerance.

3. It is recommended that visual flight rule minimums in controlled air space be increased to a 1,500-foot ceiling and 5-mile visibility. Outside of the controlled air space this minimum should be 1,500-foot ceiling and 3-mile visibility.

The establishment of the foregoing criteria would assure more reasonable ceiling and visibility requirements. Due to the density of our present air traffic and the speed of our modern aircraft, it is believed that this margin is necessary in order to afford the pilot an opportunity to see other aircraft under visual flight

rule conditions. The CAA has recommended such a change to the Civil Aeronautics Board.

4. We recommend that control zones be established at all airports having instrument approach procedures.

This recommendation would have the effect of providing positive air traffic control by a responsible agency at all fields where instrument approaches are utilized.

5. We recommend that controllers in our air-traffic control towers be given the authority to eliminate visual flight-rule traffic at a terminal when IFR approaches are being conducted.

Under present conditions, the controllers have no legal means save emergency action for refusing VFR traffic. Under present visual flight rule criteria, aircraft may be flown under extremely marginal weather conditions. The tower personnel are continuously aware of the actual operating conditions, and it is believed that their judgment would help alleviate the possibility of collision due to visual flight rule operation in visibility conditions which would not allow evasive action on the part of either aircraft in order to avoid a collision.

6. We recommend the elimination of visual flight-rule restrictions on climbing and descending as a part of any instrument flight-rule clearance.

As indicated in our previous recommendations, it is our belief that positive clearance must be provided at all times. Under visual flight-rule restrictions on climbing and descending, situations are oftentimes encountered with respect to other aircraft and unknown weather conditions which subject the aircraft to a severe collision hazard. It is believed that this type restriction has been utilized in the past out of all proportion in order to relieve the controller of responsibility during the visual flight-rule climb and descent.

7. It is recommended that a speed control should be established at all high-density areas during both instrument flight-rule and visual flight-rule conditions.

This recommendation has been successfully applied at locations such as Washington, D. C. It has a number of advantages, including the reduction of the rate of approach within high-density traffic areas with a consequent reduction in midair collision possibilities. Further, it provides the tower controllers with a common speed for all aircraft which assists them in properly expediting approaches.

8. We recommend that immediate steps be taken to provide the pilot with improved traffic information.

We are convinced that any change in a request by the pilot for a particular air traffic-control clearance should be accompanied with the reasons therefor in order to keep the pilot advised of the known traffic. Under present conditions and in view of the shortage of adequate radio aids, an effort has been made to curtail activity on the radio circuit. As a result of this trend, the pilot is not given traffic information which would be very useful to him in determining a course of action commensurate with utmost safety. This recommendation will require a speedup in the obtainment of additional communications facilities. As the committee is aware, this type information would probably have been very helpful to both pilots in avoiding the recent Grand Canyon tragedy.

9. We recommend a central accumulation and dispersal agency to issue information on navigational aids, reporting points, rules, etc., in order to assure that instrument flight-rule clearances are consistent with the latest route amendments and that both the pilot and the controller have in their possession the same information.

This recommendation is self-explanatory in nature as the resultant hazard from incorrect information relative to the route to be flown by either the controller or the pilot is obvious.

10. We recommend that all one-way airways be designated as such under both instrument flight rule conditions and visual flight rule conditions.

As presently utilized, the airway designated as a one-way airway has traffic proceeding in the same direction at all altitudes under instrument flight rule conditions. However, this does not preclude the possibility of a trip operating under visual flight rules utilizing this airway in the opposite direction and at the same altitude as the trip which has been cleared under instrument flight rules. The collision hazard under such conditions is extremely great, especially under marginal weather conditions.

The above recommendations are also contained in the attached convention resolutions entitled "Resolution No. 1" in slightly different form than shown above. Resolution No. 2, attached, contains ALPA's viewpoints on Operational Requirements That The Future Air Traffic Control System Must Meet. We be-

lieve it is self-explanatory. The other attached document contains Fifteen Additional ALPA Air Traffic Control Study Committee Recommendations, with explanatory material.

The foregoing proposals are submitted in the belief that their early implementation would greatly reduce our present air traffic problems. It is realized that they do not provide a complete answer, but it is believed that they are quite feasible and their adoption would eliminate a great deal of hazard associated with our current problems.

We very much appreciate this opportunity to comment and express our views on this important matter. Additionally, we would be very happy to provide additional assistance in the event the committee feels it would be useful to them in formulating legislation which will assure that our Federal agencies can fulfill their statutory obligations with respect to the airline industry.

Sincerely yours,

CLARENCE N. SAYEN, *President.*

RESOLUTION NO. 1

ENGINEERING AND AIR SAFETY FLIGHT RULES

The following flight rules were recommended by the air traffic control study committee and approved as association policy by the 1956 board of directors. These policies were presented and approved by mail ballot for the express purpose of minimizing collision hazards and to expedite the improvement of the air traffic control system.

DISCIPLINARY ACTION

The following items, accepted by the board of directors, should be enforced to the maximum limit, including disciplinary action as permitted in the bylaws (board 1956):

IFR in uncontrolled airspace

No air carrier pilot shall operate under actual IFR conditions in uncontrolled airspace (board 1956).

VFR climbs or descents

VFR climbs and descents shall not be initiated or accepted as part of an IFR clearance (board 1956).

Over-the-top clearances

No air carrier pilot shall accept or operate on a 1,000-on-top clearance. ALPA recommends the elimination of over-the-top clearances from the regulations (board 1956).

Positive IFR separation (within the United States)

All air carrier pilots shall operate 100 percent IFR above 9,500 feet mean sea level east of the 100° meridian and 14,500 feet west of 100° meridian. This policy is the initial step toward positive separation of traffic at all altitudes (board 1956).

VFR minimums in controlled airspace

Controlled airspace VFR minimums shall be a 1,500-foot ceiling and 5 miles visibility (board 1956).

VFR minimums elsewhere

Elsewhere, VFR minimums for air carrier operations shall be 1,500–3 (board 1956).

Airport control zones

Control zones shall be designated for all airports having instrument-approved procedures (board 1956).

Tower controller's authority to eliminate VFR operations

Tower controllers should be granted authority to limit or restrict VFR traffic from entering or departing an airport control zone when, in the opinion of the controller, weather or other conditions may affect the safe separation of traffic (board 1956).

Speed control in high density areas

Speed control should be implemented at all high density areas for both IFR and VFR operations (board 1956).

The present wide range of aircraft speeds in high-density areas should be narrowed by declaring a voluntary maximum speed for normal use in agreed-upon areas and thereby minimize the rate of closure between aircraft (board 1954).

Air traffic control information

Traffic information must be improved. Where applicable, both pilots shall be advised by airport and air traffic controllers of:

(*a*) The estimated time of arrival of conflicting traffic.
(*b*) Reasons for clearance changes.
(*c*) Known conflicting VFR, as well as IFR traffic (board 1956).

Use of new or revised airways, reporting points, holding patterns

Before new or revised airways, reporting points, holding patterns or procedures are utilized, it shall be the responsibility of the CAA to determine that the appropriate charts and information has been distributed to the carriers and pilots affected (board 1956).

One-way airways

Wherever one-way airways are designated, the restriction shall apply to VFR as well as IFR traffic (board 1956).

Implementation procedure

The air traffic control study committee will make recommendations to the board of directors on any time limits considered necessary for the implementation of ALPA policy in these matters, or possible regional or area implementation as it may seem desirable.

RESOLUTION NO. 2

Therefore, be it, *Resolved*, That the following operational requirements developed by the ALPAATC study committee be adopted as the association's requirements for increasing the efficiency and safety of air traffic.

OPERATIONAL REQUIREMENTS THAT THE FUTURE AIR TRAFFIC CONTROL SYSTEM MUST MEET

1. The system must provide at least 60 landings and 60 takeoffs per hour on dual runway airports. The system must be capable of double this capacity in event of military emergency.

2. The system must provide full, noninterfering use of airports as close together as those presently used in the New York area.

3. The system must allow flights to climb, cruise, and descend within the normal best performance ranges of the various aircraft types.

4. When the flow of traffic to a runway has been interrupted by weather or other cause, the system should be capable of absorbing the interrupted flights in safe holding positions. When the runway is reopened, the system should be capable of reestablishing a full flow of traffic to the runway, in approximately the original priority order, within 4 minutes.

5. Provision must be made to divert flights singly or in groups from one airport to other airports at the request of the pilot or aircraft operator and without requiring advance notice.

6. Overshoots, aircraft needing to return after takeoff and other emergencies must be fed back into the landing stream without delay to such aircraft and without reduction of the full rate of traffic flow to the runway.

7. The ATC system must be capable of feeding jets into the final landing operation from at least 20,000 feet.

8. Jet and piston types must be singled in the landing sequence with no reduction in the landing rate.

9. Where a single runway must be used for both takeoffs and landings, the system must be capable of opening up precise intervals in the landing stream for takeoffs. It should not require more than 4 minutes' advance notice to open an exact interval in the landing stream for a takeoff.

10. Whenever delay in the system is unavoidable and can be predicted in advance, the system should allow a pilot to (1) take the delay on the ground

prior to takeoff; (2) take the delay by cruising slower en route; or (3) take the delay by cruising at normal speed and holding in a free area near the terminal area of destination.

11. The system must not suffer a loss of safety, capacity, or efficiency on reaching saturation, whether such saturation is caused by an excess of traffic demand or by an unexpected reduction of runway capacity. In other words, the system must inherently prevent any tendency to form a logjam.

12. The system must handle aircraft that do not have the necessary airborne end of the new system. The new system must provide operational advantages in proportion to the number of equipped aircraft.

ADDITIONAL ALPA AIR TRAFFIC CONTROL STUDY COMMITTEE RECOMMENDATIONS—NOVEMBER 1956

(Approved by ALPA Board of Directors, Mail Ballot)

Recommendation 1

Reduce the number of compulsory reporting points.

Discussion: This would help reduce cockpit workload. We seriously question the need for so many compulsory reporting points, particularly where radar procedures are available. Many compulsory reporting points should be changed to "on request," especially where direct communications are utilized.

Recommendation 2

Airborne and ground communications equipment should be sufficient to eliminate the frequency congestion problem. For example, en route reporting to INSAC, separate frequencies may be assigned to flights (1) below 9,500 mean sea level; (2) 9,500 to 16,000 mean sea level; (3) flights above 16,000 mean sea level; for all aircraft, civil or military.

Discussion: Many of our frequency problems stem from the fact that some air carriers have not met airborne commitments previously made to CAA planners. CAA is able to provide more frequencies to substantially reduce overlap, but the aircraft is not capable of utilizing frequencies CAA is presently able to provide. Something has to be done to eliminate high altitude en route and short-haul flights being on the same frequency. One frequency (126.7) in the United States for contacting CAA ground stations is totally inadequate.

Recommendation 3

To increase flight safety, it is highly desirable that all aircraft, civil or military, in the same general area operate on the same frequency, whether this be a direct frequency with CAA or an AIR INC frequency.

Discussion: This can be accomplished by separating frequency usage, altitudewise, and, therefore, provide a pilot with a better means for monitoring potential conflictions.

Recommendation 4

A concentrated effort should be exerted to reduce excess verbiage. For example, airways designations should be simplified.

Discussion: ALPA has for many years attempted to bring about a reduction in verbiage, either by changing technique or airway designations.

Recommendation 5

Imperative need for installation of standard configuration A, approach lighting with sequenced flashing units at all runways serviced by ILS. Immediate installation should be made at DCA and LAX.

Discussion: Visual aids are a very important phase of IFR operations, inasmuch as installation of proper equipment will greatly reduce the abandoned approach. Consequently, with this equipment, it will not be necessary to adversely effect the terminal operations, as is oftentimes the case today.

Recommendation 6

Cositing of VOR and TACAN must be mandatory—immediate decommissioning of LF airways.

Discussion: Cositing of navigational equipment is very fundamental in order to provide the least amount of workload to pilots and controllers. Many of our present traffic-control problems are directly related to the fact that we are using two independent navigation systems simultaneously. It would be assumed that

prior to eliminating an LF airway similar navigation could be accomplished by the installation of VOR equipment.

Recommendation 7

Restricted and ADIZ areas seriously hamper satisfactory traffic control. Restrictive regulations associated with these areas often create hazardous flight conditions.

Discussion: Many undesirable routings are in effect today because airspace is designated for various military operations. It is felt that when a military operation is not being conducted that the airspace should be available for use. Also, steps should be taken wherein such restricted areas are continuously evaluated for the purpose of determining if the area shall be continued on a limited basis.

Recommendation 8

Flight capabilities of helicopters should be recognized and appropriate traffic regulations promulgated to fully utilize these capabilities.

Discussion: Presently helicopter operations by our members cannot be conducted at the approved weather minimums for the operation. This is due in great part to the fact that insufficient consideration is being given to improving the reliability of helicopter operations. It is felt that every attempt should be made to permit helicopter operations consistent with safety in order to intelligently assist in the development and expansion of this type service.

Recommendation 9

When colored and victor airways coincide and remain overlapped in the same direction, there shall be no confliction in their respective odd or even altitudes to be flown in regard to direction of flight. As an example, V–7, V–115, V–51, and B–3.

Discussion: Assuming that LF airways will not all be decommissioned immediately, this is primarily an interim measure designed to reduce the confusion associated with en route altitude operations during such conditions.

Recommendation 10

Every attempt should be made to improve cockpit visibility.

Discussion: We feel sure there is no need to comment on this point inasmuch as we feel safe in assuming that everyone shares our feelings on this point.

Recommendation 11

An urgent need exists for development and installation of accurate altimeters.

Discussion: Considerable work is being done toward designing more accurate altimeters. Accuracy becomes even more important in the operation of jets when one considers a rapid descent from a high altitude straight-on into an airport having 200–½ minimums.

Recommendation 12

Every effort should be exerted to completely eliminate cockpit paperwork in flight.

Discussion: Presently, there are many procedures being utilized for accomplishing this point. It may well be that by various changes, it will be possible to eliminate all paperwork in the cockpit except that which is unusual and requires immediate handling. For example, if maintenance procedures could be changed to require only that which is not normal, a considerable amount of paperwork could be eliminated. It is difficult to understand why it is necessary to require continuous logging of normal functioning equipment.

Recommendation 13

Effective action must be taken immediately to eliminate similar flight numbers on scheduled air carriers operating into central areas simultaneously.

Discussion: Similar sounding or same trip numbers have been one of the prime causes of airway incidents. Considerable effort has been spent on improving this problem; however, to date, very little, if any, improvement has been accomplished. When the amount of aircraft involved is considered, it is not a very easy problem to solve. However, it is felt that the seriousness of this point certainly requires a concentrated effort to bring about a satisfactory remedy.

Recommendation 14

Adequate funds be made available immediately to finance the development of a cockpit-installed device for anticollision purposes.

Discussion: There is no doubt that installation of equipment which could properly provide information for maintaining continuous separation would, in all probability, in itself provide us with the best tools for maintaining a safe operation. While much work is being done on this project, it does not appear as though we can hope for a satisfactory piece of equipment in the aircraft for at least 5 years.

Recommendation 15

Strongly recommend upgrading of controllers in high activity centers and towers to provide incentive pay.

Discussion: Presently, the manpower problem in CAA is causing a most serious condition, in view of the fact that many trained personnel are leaving the organization in order to accept better paying positions in other industries. It is extremely difficult to understand why controllers are paid the same salary regardless of the location where they accomplish their work. Because of this, it is quite difficult to obtain trained personnel in the more dense traffic areas because the controller can stay in a relatively inactive area and make the same amount of money while only doing one-fifth the work. If the pay scale were changed so as to reflect an economic advantage at the higher activity areas, this would assist in insuring for the most part the better qualified personnel would be providing the desired service.

STATEMENT OF CAPT. DAVID HALPERIN, CHAIRMAN, TWA AIR SAFETY COMMITTEE

Mr. HARRIS. Captain Halperin, I believe you are chairman of the TWA air safety committee?

Captain HALPERIN. That is correct.

Mr. HARRIS. And I believe you headed the investigation committee of this particular tragedy in the Grand Canyon?

Captain HALPERIN. Yes, sir; for the TWA panel.

Mr. HARRIS. Do you have reports you can give us from your investigation?

Captain HALPERIN. No, sir.

As you probably are aware, the investigation is under the supervision of the CAB and our participation generally follows a pattern. And that pattern is the assignment of areas, ALPA members, to the various committees.

We had a structure committee, we had a witness committee, and we had an operations committee. There were different pilots assigned to each committee.

At this point I do not believe the investigation has proceeded to the point where a report can be made. There are still some factors under consideration and we, ourselves, have not coordinated the thing, which we intend to do the first part of next week. That was the meeting that Mr. Sayen was referring to.

Mr. HARRIS. I do not suppose that you have any contribution to make to this hearing today, then?

Captain HALPERIN. Well, I don't know.

I wish that Mr. Wolverton would put the same question to me that he did to Captain Solomon.

Mr. HARRIS. I will do it.

Captain HALPERIN. I do not know if the members of the committee are aware, as the working pilot is, of how imminent the danger of collision is with us continually. Of course, it came as a tremendous surprise to us to find out, when the accident finally occurred which we had been predicting and which we had the premonition would

occur at any time, occurred at a point so far removed from the normal congestion which we usually consider.

However, we operate into some very high-density traffic areas; namely, Chicago, New York, and Washington, and as you are aware, there is a so-called near-miss program in which a pilot is completely absolved of any condemnation for his proximity to other aircraft and is then free to describe the incident that occurred to him. And this near-miss program, it is my understanding at this point, approximates four a day.

These are not casual observations; they are near misses to the extent of possibly 150 to 400 feet where one airplane misses another.

I happen to have a few of those reports with me that have been given to me by pilots, in addition to the near-miss program.

We feel that there are certain things that can be done right now without any additional funds, without anything other than the use of a certain amount of commonsense.

One of these things is that the operators normally schedule their flights to suit the convenience of the traveling public. People like to go at certain hours and like to arrive at certain hours. People by and large would be inconvenienced if their flight arrived somewhere at 3 o'clock in the morning.

On the other hand, they are very pleased when it arrives at 6 in the evening. And so we have a traffic pattern that puts a tremendous burden of congestion onto these various airports, like Chicago or Los Angeles or New York or Washington, within certain periods.

It is my personal feeling, and I believe that of the rest of the pilots, if this scheduling could spread out this congestion, that through no additional appropriations or no additional technological advancements, we would then get a certain amount of improvement.

For instance, I think any study of the peak loads would determine very quickly how the scheduling of the operators works. If you spread that peak load, it may inconvenience some of the operators. I feel sure it would. And it may also inconvenience some of the traveling public.

However, it may save some lives. And I feel that it revolves around the criteria with which you care to work.

Mr. HARRIS. Whose responsibility is it?

Captain HALPERIN. That is by and large the operator's responsibility. The traffic and sales departments set up these departures and arrivals to catch the flow of traffic or to sell the most number of tickets. I think that is one phase that should be thoroughly explored, and improvement can come about through investigation or exploration of how we can spread out these peak loads.

Mr. HARRIS. Do you think they should be evenly spread out over the 24-hour period?

Captain HALPERIN. That might be too much to expect. That would be the utmost that you could do with. But I think at least spread out over a 3- or 4-hour period.

We sometimes have 10 or 12 departures leaving at the same time. And, in addition to putting a burden on the traffic-control system, it also puts a burden on the pilot by giving him undesirable altitudes, and he has no alternatives. All the other altitudes are taken. It puts him in altitudes in weather situations that he may not particularly desire to fly, but he has no choice in the matter. There are no altitudes.

I think Mr. Sayen has gone over a good bit of the programing that the pilots firmly are in back of. We would like to see an improvement. We feel that positively that is a good bit of the answer.

We are well aware that we are operating under various limitations like these VFR restrictions.

Mr. HINSHAW. Do you mean positive control at all times or positive control under some sets of conditions.

Captain HALPERIN. I mean positive control at all times.

Mr. HINSHAW. Positive control of all aircraft?

Captain HALPERIN. Well, now, that seems to be a little more than we can digest. But at least positive control in certain areas that would be restricted to airline operations.

Mr. HINSHAW. Now you are trying to set aside certain levels, certain altitudes at which air carriers would fly, and certain routes that they would fly, and say that everyone else shall be excluded from those levels or from those routes and just have them be held for air carrier operations?

Captain HALPERIN. No, sir; I believe there is a degree of compatibility so that the control system can be designed to accommodate everyone that desires to use that space.

Mr. HINSHAW. Are you saying that everybody that is in those control zones shall be controlled?

Captain HALPERIN. Yes, sir.

Mr. HINSHAW. Or under what conditions anybody can fly?

Captain HALPERIN. No, sir; at any time. As soon as you have a situation where one can fly uncontrolled, then, in effect, you have no control under some sets of conditions?

Mr. HINSHAW. That is exactly the condition you have when an IFR flight plan is followed.

Captain HALPERIN. Under VFR conditions; yes, sir.

Mr. HINSHAW. Under VFR conditions. So you would abolish IFR flying in VFR conditions, or would you abolish the VFR? That is, on airways?

Captain HALPERIN. I would abolish the VFR flying. I would like to have full control. In other words, if you wanted to go from one point to another you would get a clearance, regardless of what the weather might be. You would get separation from other aircraft and you would have protection.

Mr. HINSHAW. How can you do that in uncontrolled areas? That is what happened here.

Captain HALPERIN. Well, you can't do it. That is our problem. We have to put those areas under control.

Mr. HINSHAW. Those areas cannot very well be put under control. The route can be put under control.

Captain HALPERIN. No; I think under a full long-range radar program, the areas can be put under control.

Mr. HINSHAW. Then you are talking about the radar-traffic-control system developed by Louis Alvarez and purchased by GE in 1948, which is in their files at the present time, no doubt.

Captain HALPERIN. That and other things. That and such factors from SAGE that can be used, or possibly TACAN adaptation. There are many approaches to the thing. I am not technically qualified to understand just how each one operates, but I do feel that if you are going to get safe operation of aircraft, you are going to have to get

protection for aircraft from other air traffic. And the only way I think you can do that is through control.

Mr. HINSHAW. One of the ways to control a good part of it now is to require that air carriers fly airways and to place airways as they presently exist under control.

Captain HALPERIN. I agree, provided the airways system can handle the traffic that is going to be put on it.

Mr. HINSHAW. Of course, it has to handle the air traffic under IFR conditions.

Captain HALPERIN. I understand that there are many airways that cannot handle that. That is one of our beefs, is the fact that we cannot do away with VFR. We must accept VFR restrictions or by and large we would not operate.

When we go out of Chicago, the standard clearance is VFR 15 miles past Joliet so we can get a climb-out. If every operator operating out of Chicago insisted on a full IFR clearance, the amount of traffic Chicago would move, compared to what they do move, would be negligible.

I think it has been so testified by CAA people previously that they cannot go into a situation of IFR exclusively at this point, that they will not be able to move the traffic.

Mr. ROGERS. Will the gentleman yield?

Mr. HINSHAW. I yield.

Mr. ROGERS. Mr. Halperin, you anticipate, then, the creation of a great number of additional air routes or airways?

Captain HALPERIN. Depending upon the system being used. I don't know whether TACAN—it is my understanding that TACAN or some of the DME situations can provide parallel routes or routes that can be adjusted, that we are not restricted to a given set of airways as presently set up.

Mr. ROGERS. You do not have any controlled airways at the present time across the Grand Canyon; do you?

Captain HALPERIN. No, sir; not to my knowledge.

Mr. ROGERS. In other words, that is all uncontrolled area, and if you forced the airlines at the present time to follow airways, there could not be any sightseeing over the Grand Canyon?

Captain HALPERIN. No. That would be one result.

Mr. ROGERS. What would you do with regard to the high flights? I mean the flights that are allowed, as I understand it, to fly transcontinental and allowed to pick their routes, either south or north, according to whatever the weather might be?

Captain HALPERIN. If you could get extension of control to the higher altitudes and establish those airways, I think those would be taken care of.

Mr. ROGERS. But you think that you ought to establish the airways at the high levels as well as at the medium and lower levels?

Captain HALPERIN. I think you have to establish the airways and the controls where the traffic is.

They tell me—and I am not familiar—that the military is now about a 30 percent user of the high altitude area. One of their beefs is that they are not getting adequate control.

And this new appropriation, it has been my understanding, has been to set up controls in the noncontrolled air space for altitudes at 24,000 and above, which, by and large, doesn't do anything for us.

Mr. ROGERS. Now, in order to take care of peak loads, would you not have to have a great deal more airports, or perhaps in some instances a great deal larger airports than you presently have?

Captain HALPERIN. No. I am speaking about the existing facilities.

In other words, everybody schedules their airplanes to arrive into New York say around 6 o'clock.

Mr. ROGERS. I understand.

Captain HALPERIN. If you had the operations and traffic people of the various airlines set up so they would not have any more than, say, 2 airplanes arriving at 6 and 2 arriving at 5:40 and 2 at 5:30, and 2 at 5:20, you would get a lot better situation trafficwise than you would if they all scheduled them to arrive at 6 o'clock.

Mr. ROGERS. Of course, that is true. Yet we have got to anticipate that there are going to be a great many more airplanes in the air in the future, and a great many more people traveling by air. And your peak load situation, as far as congestion is concerned, could be within a period of 2 hours. That would be a highly congested situation, would it not?

Captain HALPERIN. That is right. And if you do not have any better way of handling it, you will have to spread that over 4 hours, is my point.

Mr. DOLLIVER. Is that not already the fact, that, for instance, at the Midway Airport in Chicago, out of which I have flown many times, you have a congestion at certain hours of the day, and other hours of the day there is plenty of airspace; is that not right?

Captain HALPERIN. Yes, sir; that is the point I make.

Mr. FLYNT. Will the gentleman yield?

Mr. ROGERS. Yes.

Mr. FLYNT. Captain Halperin, what would be the objection, not from the standpoint of the airlines, but from the standpoint of air safety, to providing by law or by regulation that planes cannot come in or cannot have a scheduled departure time within so many minutes of each other, and so divide it so that the conflict of density will not arise?

Mr. HINSHAW. Will the gentleman yield before he answers that?

Mr. FLYNT. Yes.

Mr. HINSHAW. There was a great deal of separation between the scheduled departure time of TWA from the Los Angeles Airport and the actual time.

Mr. FLYNT. I am coming to that after he answers this question.

Captain HALPERIN. I think from no other standpoint but safety there would be an improvement, because it would tend to spread these peak periods.

Mr. FLYNT. All right, sir. That is on schedule.

Now, on actual departure time should there or should there not, in your opinion, be a minimum time interval between departure of flights? That is on actual departure time?

Captain HALPERIN. That depends on how you operate. If you are operating over a controlled airway, of course, you already have that. They do not allow it. If you are on instruments, they do not allow simultaneous departures. They have a specific procedure set up for departure of IFR traffic.

If you are talking about uncontrolled airways, an uncontrolled situation, it is questionable because of your variable speeds of the various aircraft.

In other words, there would be little point in saying that you could not send a DC–7 off in back of a Constellation, because he is a faster airplane. He is going to get there ahead of the Constellation anyway.

Mr. FLYNT. Let me make a specific reference to the Atlanta Airport.

You referred a while ago to the fact that certain lines would like airplanes to come in at 6 o'clock at a certain airport. Twelve o'clock noon seems to be the most valuable time as far as Atlanta is concerned.

For example, there are about 10 to 12 flights that are scheduled to either arrive or depart Atlanta within about a 10-minute period there.

In your opinion, is that a safe situation?

Captain HALPERIN. I think it would be safer, from a traffic congestion standpoint, to spread them out a little farther.

I assume that it is a safe operation or it would not be done with the cognizance of the regulatory bodies. But, as to whether it overloads a system or not, I feel that your chances are a lot better trafficwise if you spread them out. You just don't have so many airplanes in the same place at the same time.

Mr. FLYNT. And then, to summarize what you said with regard to separating these flights and minimizing the peak load density, it is your recommendation, based upon your investigation and your experience, that the peak load traffic density be spread out over a long period of time, or longer than apparently is existent at a great many airports at present?

Captain HALPERIN. That is exactly right, sir.

Now, another factor I would like to stress is that we have technologically many things available to us, and all we need is the money to go out and buy them and the money to go and hire the people to use them. Part of this is communications.

Mr. Sayen remarked as to how many of our operations concern a relay situation where I work my company and United works their company and American works their company, who in turn have a direct wire to the Air Traffic Control Center and they proceed to relay information and to get appropriate clearances.

Now, in certain parts of the country, where the traffic has gotten to the point where that just will not work, we have gone to a system of direct communications where we will talk directly to the controller.

Mr. DOLLIVER. You say you already have in certain points?

Captain HALPERIN. Yes, sir.

Mr. DOLLIVER. Will you specify those?

Captain HALPERIN. To my knowledge, we have it in Pittsburgh and in Chicago and in New York.

Mr. DOLLIVER. LaGuardia in New York or Idlewild?

Captain HALPERIN. New York Center, which handles all of the airports in and around the New York area.

Now, these communications move only along certain allocated frequencies. And of course, when the going gets worse, when there is the most traffic and the weather is at its worst situation is when you have the highest degree of traffic on these communications channels. It is to the point where, if you wanted to get a clearance, or to make a check point or ask for the weather, there are many times when you

have to wait 3 or 4, or 5 minutes, or even longer than that, to either give this information or get it.

Obviously, an airplane moving at 300 miles per hour is just not going to be in the same place when you eventually get the information or give it, as it was when the call was first made.

The controller situation probably takes considerably more training and experience.

Mr. DOLLIVER. May I interject a question there?

In this present system, which you call the relay system, what frequencies are used?

Captain HALPERIN. We use a company frequency.

Mr. DOLLIVER. You use the company frequency?

Captain HALPERIN. Yes, sir.

Mr. DOLLIVER. On the system in which you say you are being directed to use the tower or control center, what frequency would you use?

Captain HALPERIN. We would normally use the frequencies set up for the geographical location in which we are operating.

Mr. DOLLIVER. Would every airplane in the air be on that same frequency?

Captain HALPERIN. Yes, sir.

Mr. DOLLIVER. Would you not get an intolerable jam when everybody was trying to talk at once when you had this congested situation?

Captain HALPERIN. It occasionally gets intolerable, but for the most part it is an improvement over the relay system because of the time element involved.

In other words, you have to understand that the same controller is controlling it, regardless of whether he is speaking directly to you or picking up a number of phones and trying to control it.

Mr. DOLLIVER. The thing I am thinking of is you sometimes have situations in the airports where 3 or 4 announcers from different lines are trying to get on the public-address system all at the same time when there are more or less simultaneous departures or arrivals taking place. It seems to me that there might be a danger there which your direct system where you had congestion under stormy or bad conditions, bad arrival conditions, where you might get into an even worse situation than you have at the present time because everybody would be on the same frequency. Do you visualize such a difficulty?

Captain HALPERIN. Well, it never reaches the point of complete chaos, but it does get to the point where it becomes intolerable for a short length of time.

Mr. HALE. Fifty percent chaos?

Captain HALPERIN. Possibly. But the time element varies. It may be 2 or 3 minutes that you cannot get a word in edgewise. There again it depends on the amount of traffic involved. That is why I say we need additional frequencies. We need additional communications, and we need additional controllers.

Mr. DOLLIVER. The only point I make is that a direct communication system is by no means a panacea for this situation.

Captain HALPERIN. No. But it is a considerable improvement over the relay system.

Mr. DOLLIVER. Thank you.

Mr. HARRIS. Are there any further questions?

Mr. MACK. Yes.

Mr. HARRIS. Mr. Mack.

Mr. MACK. I would like for you to redefine positive control.

Captain HALPERIN. Positive control is, to my way of thinking, where you are going to be provided separation from other aircraft, other traffic. In other words, they have certain standards now, as far as time and altitude and lateral separation, and positive control is that which will insure you that you do get separation from other aircraft.

Mr. MACK. The reason I ask that is because I was under the impression that the TWA and the United planes were both under positive control.

Captain HALPERIN. They were under no control whatsoever.

Mr. MACK. You do not refer, then, to filing instrument flight plans as being under positive control?

Captain HALPERIN. No; because the situation as it exists now is that you may file an instrument flight plan on an airway and the minute that you are able to proceed VFR, that is, with 3 miles forward visibility and a certain distance away from clouds, that then you are responsible for your own separation which cannot be accomplished because you cannot see anything.

In the first place, you have no way of measuring whether your visibility is 3 miles, 2½ miles, 6 miles, or 20 miles. But for some reason or another, they set up 3 miles as being the criterion. And that same criterion has existed from the day of the DC–2. It just doesn't make any sense.

In the first place, you have no way of measuring whether you have got 3 miles. They give you a VFR restriction to maintain 3 miles forward visibility.

Take out of Chicago to Joliet, for example. You do not know what the weather is at Joliet. You do not know whether you can or whether you can't, but if you don't accept that clearance, there you will sit.

Mr. MACK. Then any part of a VFR clearance on an instrument flight plan is not positive control?

Captain HALPERIN. No.

Even if you had a valid clearance on a controlled airway, if you were flying in VFR conditions, that is, you had 3 miles forward visibility, you would then become obviated to maintain your own separation, because under those conditions you presumably could encounter VFR traffic that nobody has any knowledge of. So that the onus and responsibility and the burden of avoiding collision then is put on the pilot, which we for a long time have considered to be an inequitable thing.

We cannot see behind us, we cannot see beneath us. We can only see a limited space above us. And the limitations of the human are such that, depending on, one of the pilots said, the rate of closure, it may be physically impossible for you to avoid a collision.

Mr. MACK. After an airplane reaches its cruising altitude and assigned altitude, is it under positive control?

Captain HALPERIN. No, sir; because it depends on what his weather conditions are. If he is on instruments, full instruments, presumably he will be separated and given——

Mr. MACK. I am assuming that this is a flight plan on full instruments.

Captain HALPERIN. Well, it depends on the actual weather conditions in the space that you are flying. If you are on instruments, pre-

sumably you will then be afforded separation from all other aircraft. No other aircraft could be in that area unless he was on instruments. And that is the only thing that airways can give you separation from, because anyone that is flying VFR, you see, is not on the air traffic control board. He is not in communication with the air traffic control centers, and he is just going on his way, maintaining his own separation.

Mr. MACDONALD. Will the gentleman yield?

Mr. MACK. Yes, I yield.

Mr. MACDONALD. When you say any aircraft, does that apply to the military as well?

Captain HALPERIN. Oh, yes.

Mr. MACDONALD. In these controlled areas, suppose a SAC Commission is operating. Are they controlled?

Captain HALPERIN. You are getting out of the realm of my knowledge. I don't know whether they are controlled or not. I know that if they are utilizing a Federal airway that they will either block the space for them—in other words, they will put a restriction on the use of that air space until the fueling operation or mission gets out of the way, or they will go on a regular flight plan.

Mr. MACK. Let me pursue that a little further.

Your concern is not about the airplanes that have filed an instrument flight plan, but about the planes that they might encounter on the airways that have filed VFR flight plans; is that correct?

I am trying to define what this term "positive control" really means.

Captain HALPERIN. Let me put it this way:

Any time, regardless of what your flight plan is, or regardless of what your clearance is, or regardless of what the traffic control agency is that is working with you, any time you are in VFR conditions, you have no control.

Mr. MACK. Regardless of what the instrument flight plan reads?

Captain HALPERIN. That is correct. And the reason for that——

Mr. MACK. They do not have control over the one airplane?

Mr. HINSHAW. No. They have got control over no airplane that is VFR. They have control over the IFR planes but not over all the VFR.

Mr. MACK. That is my argument.

Captain HALPERIN. So you, in effect, have no control.

Mr. MACK. They have positive control over the one airplane. And they have control over him, if he has an instrument flight plan flying at a certain altitude whether he is flying in VFR conditions or instrument conditions?

Captain HALPERIN. That is right; except for the fact that when he is in VFR conditions, he can at any time cancel his IFR and they have no further control over him. And he can do anything he wants. He can change his altitude or he can detour on his route, or he can, in accord with company procedures, take off across country.

Mr. MACK. So you agree with me that the question is on the VFR flight plan, so far as positive control is concerned, and not on the instrument flight plan, because when he cancels out his instrument flight plan he is automatically in VFR conditions.

Captain HALPERIN. He was on VFR conditions before he canceled his flight plan, you see.

Mr. MACK. Yes. But they had positive control until such time that he canceled his IFR flight plan, over the one aircraft.

Captain HALPERIN. I think control is a misnomer there.

I think when I refer to control I mean separation. When I advocate positive control, I advocate being supplied separation from all other aircraft within certain defined limits of airspace, and/or time.

Mr. MACK. I think this committee is probably interested in carrying out your ideas of positive control. That is the reason that I wanted to clear up the definition of positive control.

And, as I stated originally, mentioning the two airplanes that collided being under positive control, according to your definition that was a loose interpretation of it?

Captain HALPERIN. No.

Maybe the whole problem revolves around the word "control." If I substitute for "control" the word "separation," and if I say positive separation, then it becomes clear that the two aircraft that were over the canyon had no separation afforded to them by any regulatory agency whatever and were restricted only to providing their own separation, which, to a large degree, they are unable to do due to the mechanical limitations of their aircraft structure and their visibility.

Mr. MACK. I am corrected on that, then.

There was 1 of the 2 airplanes that had been assigned a specific altitude on an instrument flight plan.

Captain HALPERIN. If we go back to our definition, saying, instead of "control," the word "separation," that neither one of those aircraft were being provided separation in that they were in a noncontrolled area and that the aircraft flying in that area is VFR traffic that the airways knew nothing about, they were not obligated to advise the airplanes in question of this traffic or any other traffic. They just were not being provided separation, neither one of the aircraft.

Mr. HARRIS. One of your associates wanted to help you out with something.

Captain SLEETH. I wanted to make a point on noncontrolled areas.

Captain HALPERIN. This is in a noncontrolled airspace that legally anybody could be in under any conditions. You see, there is no separation provided, regardless of what your clearance read. The only reason they give you that clearance and you accept that clearance is so that when you join an airway or go through a controlled airspace, then you will be at an assigned altitude and you will be provided separation from other traffic in that controlled area. And it is not until you reach the airway that anybody is interested in your actual separation from other aircraft.

For instance, if you are approaching an airway at, say, seventeen to nineteen thousand, and somebody else was going northbound at 19,000 and it appeared that you would be within the time limits, then you would either be asked to descend or cross the airway at another altitude, or the man on the airway would be asked to either climb or descend from that altitude. Only on that airway would you have your separation.

Mr. MACK. Our off-airways altitude assignments amount to about the same thing as the British system, on a hit-and-miss proposition; is that correct?

Captain HALPERIN. I don't know the British system, but I would think so.

Mr. HARRIS. This is no reflection on the man who was on duty at the time, but was there any reason why the man on duty at Needles, when he received a report from the TWA plane that he was at 21,000 feet and his estimated time at Painted Desert was 1031, and when immediately after that the station at Needles received a report from United that he was at 21,000 feet and his estimated arrival at Painted Desert was 1031, is there any reason why the operator then, under the rules, should not have been required to have notified both planes that the other one was at the same altitude and would reach the same area at the same time?

Captain HALPERIN. Well, I believe so, sir, in that it is my understanding that one of these aircraft had what is referred to as a thousand on top clearance. And when he reported his altitude, I am sure he probably included the words "a thousand on top." As soon as that phrase is used, that has the same connotation as saying VFR because your 1,000 on top means that you are VFR.

Mr. HARRIS. I realize that. But, nevertheless, the facts are that he reported he was at 21,000 feet, flying at 21,000 feet, with an estimated arrival at Painted Desert at 1031.

Captain HALPERIN. But you see, he was not even obligated to report his altitude. All he had to say was he was a thousand on top.

Mr. HARRIS. I appreciate that. But he did report it and the station operator had the information.

Captain HALPERIN. Well, that is up to the individual operator. You asked me as to the legal requirements.

Mr. HARRIS. No. I asked you is there any reason why there should not be a legal requirement?

Captain HALPERIN. Well, I would not know whether there is any reason why there should or should not be.

Mr. HARRIS. I understand there isn't. The operator cannot be criticized for it if the rules just failed to provide certain instructions. But it seems to me that the rules, or whatever the procedure is, should have been set to require a man who is stationed there, when he gets reports from these two planes that they are going to the same destination and at that time, just a few minutes beforehand, he gets them at the same altitude, that he should warn both planes that the other one is coming.

Captain HALPERIN. That is putting a partial, or at least a very small bit of control into a noncontrolled area, in that then the operator would become responsible to advise the other of his traffic, even though he is not on a controlled airway. And if they want to make that regulation, I see nothing wrong with it.

You are just getting a very small portion of control in an otherwise completely uncontrolled area.

Mr. HARRIS. Well, the point to me is a highly important policy matter, and that is where the pilot of one line might be warned or advised that another plane is within the same area.

Captain HALPERIN. I think that would be highly desirable.

Mr. HARRIS. Is there any reason why that should not be required by positive rules of procedure?

Captain HALPERIN. I cannot think of any reason. We have advocated——

Mr. HARRIS. You have flown a lot, have you not?

Captain HALPERIN. Yes, sir.

Mr. HARRIS. Is there any way that you go about trying to find out what other plane leaves Los Angeles, say, just before or just after yours, or maybe at the same time, going in the same general direction? Do you ever know about it?

Captain HALPERIN. On a controlled airway; yes, sir. We always know about it. We are given all the central traffic on controlled airways.

Mr. HARRIS. Both planes left Los Angeles under controlled conditions.

Captain HALPERIN. But they were departing different routes. They were being provided separation by lateral means until such point as they had long since left the control area.

Mr. HARRIS. I understood from information that the TWA plane knew nothing about the United plane until after he had gotten off and gotten out in the air and made this request for his change in flight plan.

I also understood that the United plane never did know anything about the TWA plane leaving, or even if he was in the air.

Captain HALPERIN. This is all set forth in the specifications, for instance, of the central traffic.

If you have an airplane going east and an airplane going north, under the present situation nobody is particularly burdened to advise you that the other airplane is departing at the same time you are. If you have an altitude assignment already given to you, nobody is particularly burdened with telling you that a man is going to proceed VFR a thousand on top.

You have the altitude and you are in shape. But the other airplane, when he requests clearance, has to be told he cannot have it because you are already there. That is under the present situation.

Mr. HARRIS. Yes. But if you use this procedure, I cannot see any difference in it when you say you can go to 1,000 on top. When this man asked to go to 21,000 feet and they would not let him go there, but then they say to go to 1,000 on top and he went there anyway.

Captain HALPERIN. In effect, what he has done is canceled his IFR, in which case the controller loses complete control of him.

Mr. HARRIS. The point that I seem to get from all of this is that the suggestion is made, as you have indicated before, that the airlines ought to be required to fly the airways under controlled conditions.

When you get to talking about what should be done to make that safe, then it seems to get a little bit under the side of controlled conditions, and you have some question about that.

Captain HALPERIN. I have no real question about it except the practicality. I know from experience that they cannot control all traffic in the present state of the airway system development.

Mr. HARRIS. Then the airways systems need revision?

Captain HALPERIN. Yes, sir.

Mr. HARRIS. Mr. Hinshaw.

Mr. HINSHAW. I would like to confirm one idea that I have in mind.

I think from the testimony that the person entering an uncontrolled zone on an IFR flight plan is thereafter considered to be VFR, is he not, until he reenters the controlled zone?

Captain HALPERIN. No, I don't think he is considered to be VFR. I think he is considered as not to the traffic information until such

time as he reenters a controlled area. He can change his altitude or he can divert or he can do anything he wants to.

Mr. HINSHAW. Then why should a person who enters an uncontrolled zone on a VFR plan receive traffic?

Captain HALPERIN. I do not think he is given traffic if he is VFR.

Mr. HINSHAW. Yes, sir; he was given traffic. He was given traffic by the Salt Lake operator, that United was his traffic, United 718.

Captain SLEETH. Sir?

Mr. HINSHAW. What is your name?

STATEMENT OF CAPT. GEORGE SLEETH, LOS ANGELES SAFETY COMMITTEE

Captain SLEETH. My name is George Sleeth.

Mr. HINSHAW. Would you give your identification?

Captain SLEETH. I am with the Los Angeles Safety Committee, acting as a committee member with Mr. Halperin. And I served on this operations committee with the CAB and I think I can clarify that question.

Mr. HINSHAW. Very well.

Captain SLEETH. That was called an advisory message. There was some conversation between Salt Lake center and Los Angeles center where they noticed these two courses converged, and they just gave that for advisory purposes. It was not required.

Mr. HINSHAW. Should it be required?

Captain SLEETH. Yes, sir.

Mr. HINSHAW. Should it be required that the captain entering the uncontrolled zone under an IFR plan be advised of the other traffic?

Captain SLEETH. I think it would be desirable to have both aircraft have the information.

Mr. HINSHAW. Do you not think, if one was given it, the other should receive it?

Captain SLEETH. Yes, sir.

It is not customary under these conditions, because——

Mr. HINSHAW. Of course it is not customary because it has never happened. That is, a person enters an uncontrolled zone under an IFR flight plan and he receives no traffic. Under a VFR flight plan he may receive an advisory.

Captain SLEETH. The traffic advisory that we receive is only very pertinent traffic because of the congestion and overloading of the controllers on this thing. They have given less and less traffic information as years go by. Very often we do not get any traffic information, even when it is pertinent.

Mr. HINSHAW. If you are on the committee, you will wonder with me why it is that two fellows can skate around over the Grand Canyon with a lot of clouds sticking up and one of them knows the other one is traffic.

Captain SLEETH. There could be any number of traffic out there, either visual or instrument, that would be unknown under the present regulations.

Mr. HINSHAW. Unless we can establish the proper route under control over the Grand Canyon, ought we not to restrict aircraft from going over the Grand Canyon?

Captain SLEETH. As Mr. Halperin has pointed out, we do not believe that that is physically possible.

Mr. HINSHAW. What?

Captain SLEETH. To confine all air-carrier traffic to controlled airspace under controlled conditions.

Mr. HINSHAW. Why not?

Captain SLEETH. There is not enough airspace available under the present airway system.

Mr. HINSHAW. Now you are saying that there is not enough airspace available. But you are including all the other traffic besides air-carrier traffic.

Captain SLEETH. No, sir.

Mr. HINSHAW. Because there are 18,000 business and professional aircraft in the air, some thirty or forty thousand private aircraft in the air, and the Lord only knows how many military aircraft in the air.

You are talking about those because obviously, if the air-carrier aircraft were the only aircraft in the air, there would be plenty of room.

Captain SLEETH. I am not so sure whether I concur or not, sir. I do not know whether that is obvious or not.

There are a great many of us out there flying VFR whenever possible because we are unable to get controlled airspace, and I don't know what effect the other aircraft have. But in certain areas, I think there is enough air-carrier traffic to overload the present airways.

Mr. HINSHAW. There is obviously something wrong. Whether you agree with what I have said or whether I agree with what you have said, or anybody agrees with anybody else, there is obviously something wrong.

Captain SLEETH. Yes, sir.

Mr. HINSHAW. The thing to do is knock heads together and get it straightened out, is it not? And we had better do that quickly.

Mr. HALE. Knocking heads together is better than knocking planes together.

Mr. HINSHAW. My friend Mr. Hale says it is better to knock heads than to knock planes.

Mr. HARRIS. Are there any further questions?

Mr. HALE. Mr. Chairman?

Mr. HARRIS. Mr. Hale.

STATEMENT OF CAPT. DAVID HALPERIN, CHAIRMAN, TWA AIR SAFETY COMMITTEE—Resumed

Mr. HALE. Under existing conditions with planes as now designed, and under the most favorable weather conditions, no plane can guarantee its own separation. Is that correct?

Captain HALPERIN. We do not believe it can; that is correct, sir.

Mr. HALE. What I want to know is this:

Suppose a plane takes off from National Airport here going to La Guardia. He is on a controlled airway all the time, is he not?

Captain HALPERIN. Yes, sir.

Mr. HALE. And National Airport assigns him, we will say, 12,000 feet.

Captain HALPERIN. Yes.

Mr. HALE. And at a point up toward Philadelphia, he runs into a very severe thundershower and he wants to do something about it, go under it or around it or something.

What does he do? Does he notify National Airport, or what does he do?

Captain HALPERIN. He would probably at that point be in touch with New York center by direct communication.

Mr. HALE. The New York what?

Captain HALPERIN. New York traffic control center.

Mr. HALE. All right. What does he do?

Captain HALPERIN. I would imagine the first thing he would do is ask for a lower altitude. Thunderstorms are flown better at low altitudes than they are at the freezing-level altitude.

Mr. HALE. At any rate, he would ask for a different altitude, would he not?

Captain HALPERIN. Yes, sir.

Mr. HALE. Or he might ask to alter his course to the east or to the west, might he not?

Captain HALPERIN. He might ask for that, yes; a rerouting.

Mr. HALE. Then what do they do in LaGuardia, or wherever the control point would be?

Captain HALPERIN. Under the present situation, they will say "unable."

Mr. HALE. They say, in effect, you can just go through the storm, no matter how bad it is?

Captain HALPERIN. Yes, sir.

Mr. HALE. That is not entirely a satisfactory situation, is it?

Captain HALPERIN. Not to the pilot; no, sir.

Mr. HALE. In other words, under those conditions the pilot is a mere automaton?

Captain HALPERIN. Yes, sir. He has no recourse.

Mr. HALE. And the actual decision as to his route is made 100 miles away by people who don't know anything about the conditions?

Captain HALPERIN. That is right.

Mr. HINSHAW. And they may not even be looking out the window.

Mr. HALE. They probably aren't.

Captain HALPERIN. That is exactly correct, sir.

Mr. HALE. I do not know that I feel awfully keen about bringing about that situation.

Captain HALPERIN. We do not feel very keen about it either.

Mr. HALE. What is the answer?

If you cannot protect the plane flying visually and you cannot give a plane instrument flight instructions which will keep him out of the bad weather, you are in a hell of a fix, to put it mildly.

Captain HALPERIN. I see you have the point.

Mr. HALE. You do not know the answer to that one, do you?

Captain HALPERIN. No, sir; it is a very complex thing. And all you gentlemen and many other agencies will just have to get together and try and help us out.

Mr. HALE. I must say one thing that has impressed me in the hearings today is, it seems to me, that the airplane designers ought to knock their heads together and produce planes that you can at least see out of.

Captain HALPERIN. It is not that simple as we approach the higher speeds, because even if you could see out, it is difficult.

For instance, some of the small silhouettes, say an airplane approaching head on at 12 to 15 miles, would be very difficult to see. And if he is approaching you at a rate of 600 miles an hour, the length of time that is going to be available for you to see him and avoid him becomes negligible.

It is my understanding that on some of the high-speed military jets they find the pilot is incapable of taking evasive action after an attack. He closes on an airplane and he fires his rockets or his machineguns and he is going so fast that his reaction time is not sufficient to allow him to take evasive action to keep from striking that airplane.

So on the radar site, they have a mechanical contrivance whereby once the range gets so close the radar will take over the controls and take the evasive action for him.

In other words, the airplane designer is not too much at fault. We are reaching the point of human limitation on this.

Mr. HALE. Well, I can well understand that, that the airplane designer cannot do everything. But it does seem to me they can do better than they are doing now.

Captain HALPERIN. Well, they are getting better. They are giving us more window space.

Mr. HALE. Let me ask you this:

Under ideal conditions of visibility, say, at 10,000 feet, how far could you see a DC–7 or DC–6?

Captain HALPERIN. It would depend on whether you were looking into the sun or whether the airplane was approaching you head on, or whether it was in silhouette.

Mr. HALE. I know, but I am assuming the plane coming head on.

Captain HALPERIN. How far away could you see a DC–6 directly in front of you?

Mr. HALE. Yes.

Captain HALPERIN. Fifteen miles, maybe.

Mr. HINSHAW. In absolutely clear weather.

Captain HALPERIN. Or 18 miles.

Mr. HALE. If you are in a DC–6 and you are approaching each other, it would be at the rate of 10 miles a minute.

Captain HALPERIN. That is right.

Mr. HALE. So you have got a minute and a half to avoid him after you see him.

Captain HALPERIN. Yes, sir.

Mr. HALE. Which should be enough, should it not?

Captain HALPERIN. Well, if you see him.

It has been told to me that when the British were operating the Comets, no Comet pilot ever saw another Comet except on the ground, despite the fact they were traveling the same routes back and forth all the time.

In other words, in this proposition of seeing an airplane, you can have a tremendous amount of sky and space, and you are trying to pick out one little dot. And quite often it escapes you and you don't see it. And of course, if you figure that one man at that point is filling out his log sheet for a check point, and the other man is retuning the radio, that minute and a half evaporates mighty fast.

Mr. HALE. No doubt you are right.

It is not too comforting.

Mr. WILLIAMS. Mr. Chairman?

Mr. HARRIS. Mr. Williams.

Mr. WILLIAMS. Mr. Halperin, I listened to the hearings out in Las Vegas and I have listened to these and I am still confused about one thing in regard to the IFR clearance.

Let's take the case of the United Air Lines plane which had IFR at 21,000 assigned altitude. So long as he was on the airway, he was required to maintain 21,000 feet, whether he was on actual instrument conditions or on VFR conditions. That is very clear to me.

Also, he is required, if he crosses an airway—which he did, he crossed the airway between Boulder City and Prescott, Red 15—to cross that at 21,000 feet.

After he crossed that and he got out into what we have called the uncontrolled area off the airways, was he bound to that 21,000-foot altitude, even though he was still under an IFR clearance at that assigned altitude?

Captain HALPERIN. No; he could have gone to any altitude he so desired at that point without notifying anyone. That is legally I am speaking of.

Mr. WILLIAMS. All right.

He can go to any altitude he wanted to. Assuming that he ran into actual instrument conditions, does that still apply? Did he still have that alternative?

Captain HALPERIN. I believe so; yes, sir.

Mr. WILLIAMS. Under actual instrument conditions?

Captain HALPERIN. Yes, sir.

Mr. WILLIAMS. I do not have it on this map, but I assume that he had to go on another airway before he landed at his destination. He would have, unless he had changed his clearance before he reached there, had to enter that area at 21,000 feet, would he not?

Captain HALPERIN. Yes, sir.

Mr. WILLIAMS. So, between the time that he left Red 15 and until he rejoined an airway, he was free to fly under any conditions and at any altitude that he saw fit?

Captain HALPERIN. Legally; yes, sir.

Mr. WILLIAMS. I believe that is all.

Mr. HARRIS. Mr. Mack, do you have any further questions?

Mr. MACK. I wanted to ask about positive control.

The only way you could get positive control—and I am assuming that you are recommending it—is to have all of the instrument flight plans on controlled airways?

Captain HALPERIN. I wish we would delete the word "control" at this point and substitute "positive separation."

Mr. MACK. On airways.

Captain HALPERIN. Then what you say is by and large correct, that everybody must have a clearance.

Mr. MACK. And that gives you positive control——

Captain HALPERIN. Regardless of the weather.

Mr. MACK. Over all of the aircraft on the particular airway.

Captain HALPERIN. That is right.

If everybody on that particular airway had a clearance, regardless of what the weather conditions were, then you would have positive separation.

Mr. MACK. It can be done, then, without the use of radar. It can be done without addition of further facilities?

Captain HALPERIN. It depends upon the number of aircraft. Yes; it can be done because there are enough check points so that you can establish your position navigationally and through communications, and a controller can regulate this traffic without recourse to radar.

Mr. MACK. I do not want to extend this hearing too long, but you mentioned Chicago departures.

I assume that they do not have radar departure control at Chicago. Is that correct?

Captain HALPERIN. Well, I think they are trying to get it in. They either have it at this point or will very shortly.

Mr. MACK. Does the system that they use here meet all of the objections?

Captain HALPERIN. Yes, sir. They have radar departure here at Washington and they have radar departure out of New York.

Mr. MACK. Chicago has not implemented it as yet; is that correct?

Captain HALPERIN. I don't know as of today. The last time I was in there, about a month ago, they had not.

Mr. MACK. But it would solve that problem in Chicago at the time that they do have it?

Captain HALPERIN. It would solve that particular problem, but not Mr. Wolverton's problem.

In other words, they would send you through the weather.

Mr. MACK. You would be able to eliminate the VFR portion and arrive at your instrument assigned altitude on the airway.

Captain HALPERIN. Yes, sir; until the radar shuts down for a heavy rain shower or some other thing.

Mr. WILLIAMS. I have one more question.

I think you straightened me out on the IFR situation.

Now, as to the TWA plane which had VFR clearance at a thousand on top, once he left the airways and was flying in this uncontrolled area off the airways, was he bound to the thousand foot on top under actual VFR flying conditions, or if he encountered instrument conditions would it have been necessary for him to have changed his clearance in order to go on instruments?

Captain HALPERIN. No. Legally he could have changed his altitude or gone on instruments or done anything. He would have been in the same position as the other airplane with regard to that clearance only over controlled airways. In other words, he would have had to have left the airway at a thousand on top and he would have had to cross airways at a thousand on top, and he would have had to join airways at a thousand on top. But in between, in the uncontrolled space, he could have done anything he wanted to.

Mr. WILLIAMS. In other words, once they left the airways, both planes were free to do anything they wanted to do?

Captain HALPERIN. Yes, sir.

Mr. WILLIAMS. Thank you.

Mr. HARRIS. You do think that the airways, then, should be revised?

Captain HALPERIN. Yes, sir.

Mr. HARRIS. You think there should be more of them?

Captain HALPERIN. Yes, sir.

Mr. HARRIS. Should they be revised and sufficient highways of the air established, do you think then that the commercial planes should be required to follow them?

Captain HALPERIN. Yes, sir.

Mr. HARRIS. Then if I understand you correctly, you would advocate positive separation but not positive control. In other words, you want positive separation but you do not want to have rigid control over that airplane. Is that what I understand?

Captain HALPERIN. No; we can have it either way you want it.

To my mind, I was just trying to make sure that the word "control" was used in its proper sense. We want positive separation.

Mr. HARRIS. That is what I wanted to get.

Captain HALPERIN. If positive separation means positive control, then we want positive control.

Mr. HARRIS. I can understand that there is a difference between the two terms.

Captain HALPERIN. Not to my way of thinking. I do not think you can have one without the other.

Mr. HARRIS. Are there any further questions?

If not, thank you very much, Captain Halperin. And I hope you will do us the favor—I am sure you will—of seeing that we get the report from your meeting next week.

Captain HALPERIN. Yes, sir; thank you.

(The following information was later received from Captain Halperin:)

AIR LINE PILOTS ASSOCIATION,
Kansas City, Mo., July 30, 1956.

Hon. O. A. HARRIS,
Chairman, Subcommittee Foreign Affairs and Interstate Commerce Investigating Grand Canyon Accident, Washington D. C.

DEAR MR. HARRIS: In connection with your investigation of the Grand Canyon accident, I was called upon to testify before your committee and expressed some of my views concerning the hazards of midair collision under the inadequate air traffic control procedures that exist today under the present system. I was instructed, as were the other members of my committee, to forward a report listing our recommendations for improvements that might be immediately forthcoming.

My committee, together with United Airlines' investigating committee, met in Chicago on July 23 and 24 to prepare this report, which will be forthcoming from Air Line Pilots Association headquarters.

I have a considerable amount of firsthand information which has come directly from TWA pilots. This information has been gathered during the pilots' routine, everyday working conditions and represents only the merest fraction of incidents of this type that are encountered on the Nation's airways. This information is enclosed herewith. Inasmuch as there are graphic, firsthand accounts, I believe you will find them most helpful in your consideration of the factors which led to the tragic accident at Grand Canyon on June 30.

I would like you to feel, sir, that I, along with all the other TWA pilots, am most anxious to cooperate with your committee in furnishing you with whatever information you will consider helpful It is with the full realization and understanding that only through adequate legislation and interest on the part of the representatives of the people of the United States can improvement come about.

Yours respectfully,

DAVID HALPERIN,
Chairman, TWA Central Air Safety Committee.

AIR LINE PILOTS ASSOCIATION, KANSAS CITY, MO.

From a letter by Capt. C. O. Johnson, dated July 16, 1956 (F. No. 131, plane 813, July 13, 1956)

"At approximately 5 a. m. I was on an IFR clearance. A Braniff Convair was also on an IFR clearance. He had just taken off from MKC and I had been cleared for an ILS approach into MKC by MKC radar. They were supposed to be watching me on radar. They were giving me headings, guiding me to the outer marker. I was between Liberty radio beacon and the outer marker on a heading of 270° magnetic, descending to 2,500 mean sea level. At approximately 2,800 mean sea level, under restricted visibility, RNF Convair appeared immediately in front of me. I immediately dove the airplane to miss Braniff, and would estimate that I missed him by approximately 150 feet. I immediately called MKC radar operator and advised him of the near miss with Braniff and asked him if Braniff was on an IFR clearance. The operator advised me that Braniff was on an IFR clearance and supposed to be north of the MKC omnirange. I also asked the radar operator if he did not observe Braniff and myself on his radarscope. His answer was, "I guess I must have goofed." At the time of the incident, Braniff was not north of the outer marker, as the radar operator advised me."

From a letter from George Toop, dated July 16, 1956

"I. Anticollision lights are O. K. for spotting aircraft in the vicinity, but as to whether they are coming, going, or standing still, they are very poor. One night I sat and watched one for 10 minutes, having decided it was going same way I was. The next instant it flashed by. Watching it had sort of hypnotized me.

"II. I believe that they should be directional. I'm for strict IFR not VFR climbing, descending or 1,000 feet on top. I'm breaking my neck looking, but is the other guy? Have you ever come into LGA and run up against a helicopter with airline flashing light thinking it was moving, only to find it's standing still or backing into you. Let's get them lit some other way."

From a letter from John E. Clark, dated June 19, 1956

"On June 18, 1956, aboard flight 26 between Washington and Baltimore on an IFR clearance to the Baltimore outer marker for an ILS approach to runway 10 to maintain 1,600 feet, we encountered rain showers between Beltsville and outer marker. Although we were below the cloud base, the rain showers lowered the forward visability to practically zero, making an instrument approach procedure necessary. We arrived over Baltimore outer marker at 1526 E and advised the tower we were proceeding with ILS approach. During our turn to the outbound heading for procedure turn, an American Airlines Convair was observed out of the copilot's side window in close proximity to our flight and already in process of taking evasive action. I also initiated evasive action immediately. This was immediately reported to Baltimore tower which replied that we were the only known traffic in that vicinity. Approach and landing was completed to runway 10 and the flight was in moderate rain showers until within less than 1 mile of the field. A check was made upon landing at Baltimore to determine what American flight was in the area at that time. It was determined that American southbound flight No. 381 reported over Beltsville at 1529 VFR. This was 3 minutes after the incident. I questioned Baltimore tower as to the reason why I was not advised by Baltimore radar of this traffic involved. I was advised that due to the rain shower intensity in vicinity of outer marker that our flight was lost on the scope and that American's flight was not observed. In view of the above, I feel that VFR flights through the area at that time were impossible and that American's conduct in this instance seriously infringed upon the safety of others and themselves."

From R. G. Flett, letter dated July 12, 1956

"On flight of July 6, 1956, at STL I had a near miss with a McDonald Demon Jet No. 522, Pilot Huelsbeck. Weather was about 1,200 to 1,400 feet and 3 to 6 miles visibility. I was on IFR and had made a late ADF approach to land on No. 12. The tower had 2 other aircraft ahead of me, 1 of which, I think, was an American landing south, and the other a McDonald Voodoo in trouble. After deciding not to make a right turn into No. 12 we were proceeding to cross the airport at about 1,000 feet above ground when we sighted the unreported jet coming at us at about a 90° angle from the left. There was no time for a turn. We climbed a few hundred feet and called tower. He then dived a little and turned a little to our rear. He had failed to call tower before entering traffic—

was watching the Voodoo. Tower operator on duty was Mr. Hendricks. Tower operator called Huelsbeck. I tried to call him next day on return through STL, but he was not in. Extremely poor operation, considering the weather."

From a letter by C. C. Woodall dated June 15, 1956

"F35–15 maintaining 22,000 feet on V–116 approaching Salem VOR just on top of overcast. A jet (fighter type) airplane came alongside with approximately 1,000 feet horizontal separation, then turned left across my path at approximately 500 feet in front and 200 feet below. In and out of top of overcast. I checked Salem VOR at 10:16 eastern standard time I immediately contacted the Detroit center and they advised me it was possibly a T–33 (Canadian) that was cleared to climb to 23,000 feet VFR."

From a letter by E. W. Straw dated June 21, 1956

"On flight 432 of June 20 I was cleared from CMH to the Pit airport via airway green 4 HLG DIR to maintain 7,000 feet with a climb well to the right of airway green 4 to 7,000 feet. During takeoff we were cleared by the tower to make a left turn after takeoff. CMH weather 1228 E sequence: M12 plus 3/4 TRK plus F CMH weather 1328: 813 M 10 80 plus 4. We were off the ground at 1339 Est and made a left hand climbing turn to a heading of 120° and continued our climb. At 2,500 feet mean sea level when we were on and off instruments a jet aircraft passed across our flight path at our altitude approximately 100 yards ahead of us on an approximate heading of 330°. This all happened so fast no evasive action was taken as he was just past our nose when he was spotted. At no time were we in VFR conditions after we started our turn from takeoff. I immediately called CMH control tower and he advised me the plane was Navy plane 788 and VFR. At no time did the tower radar advisory tell me of any other aircraft in the vicinity although on our approach to the airport before landing they gave us very fine pertinent information about traffic."

From a letter by H. E. Heinrich dated May 10, 1956

"Due to weather conditions in the New York area, I retained my IFR clearance even though I was below the clouds and the field was in sight. I was flying flight 312, May 2, 1956, plane 707. There were rain showers and the visibility was fluctuating. The traffic was landing on runway 13 at LaGuardia Field. Upon checking over the field, I was advised by the tower that flight 312 was No. 3 to land. I had previously heard an American Airlines flight check VFR northeast and then Lodestar N80A (believe this right number) also check northeast of the field VFR. The tower cleared the American Airlines plane to land, which was on final approach. The tower then started calling Lodestar N80A for his position. After two calls he answered that he was coming up on the Five Stacks. The tower could not locate the airplane and neither could I, due to the rain on the windshield and visibility being less than 3 miles even out the side window. The tower and I spotted the Lodestar at the same time, and he was then east of the Five Stacks. By this time I was south of the Bronx tank. Therefore, my flight pattern had to be extended on out to the point where I was unable to actually see the field. I retained my IFR clearance due to the reported weather and due to past experience of the area problems. I felt that this was the safest way to conduct my flight, but I find this not satisfactory because of the other airplanes flying so called VFR. This situation is happening very frequently at all the controlled airports. Higher limits for VFR flight in control areas have been discussed and considered. It is time for us to request this."

From J. W. Ownby, July 27, 1956

"Flight No. 58, June 28, 1956. At about 12:20 e. s. t. we approached LGA from Flatbush for landing runway 22. Entered pattern east of field at 1,500 feet. Cleared No. 3 behind an American Convair over the range station. Extended downwind to Whitestone Bridge, taking interval on the Convair. Followed him over range for a long straight-in to runway 22. By now cleared No. 2 to land behind the Convair. Another American Convair was cleared No. 3 behind the Constellation. As No. 1 touched down tower advised it would like to get a departure out on runway 13 prior to our landing. Approach flaps were set. At 5 to 600 feet and about 2 miles out on final, the landing gear of No. 3 American Convair was observed entering our field of vision at the top of our windshield, directly above and about 40 to 80 feet descending. An immediate nose down right turn was begun and standard go-around procedure initiated. The tower was asked by us where the Convair had come from. The tower immediately ordered the Convair to pull up and go around, advising him that a

Connie was No. 1 on final. American initiated a climbing left turn. The tower reminded the Convair at this point that he had been cleared No. 3 behind the Constellation and had failed to report the range station inbound. The Convair answered that he had understood he was No. 2 behind the Convair which, of course, we (flight 58) were following also, as instructed."

From a near-collision report from Capt. H. W. Truesdale

While on an IFR flight plan at 21,000 feet, TWA flight 69 en route San Francisco to Chicago, 20 miles east of the Omaha omnirange, experienced a near collision. The following is the captain's statement:

"We were on course on victor 6. Saw the jet so briefly identification not possible. No time to move a control and it would have been dangerous, as the jet wing may have overlapped our left-wing tip."

It appears that the jet aircraft was about 10 feet above and 50 feet horizontally from the TWA aircraft.

Mr. HARRIS. Mr. Heflinger?

Captain LOVETT. Mr. Heflinger is the actual accident representative from Los Angeles.

I am general air safety chairman from United. He is not here.

STATEMENT OF CAPT. JOHN A. LOVETT, CHAIRMAN, UNITED AIR LINES CENTRAL COMMITTEE

Mr. HARRIS. What is your name?

Captain LOVETT. Lovett.

Mr. HARRIS. Capt. John A. Lovett?

Captain LOVETT. That is correct.

Mr. HARRIS. You are the chairman of the United Air Lines Central Committee?

Captain LOVETT. Yes, sir.

Mr. HARRIS. He is chairman of the safety group?

Captain LOVETT. In the Los Angeles area.

Mr. HARRIS. Do you have anything further that you would like to comment on, or have we covered this?

Captain LOVETT. I think probably between Mr. Sayen's remarks and Captain Halperin's it has been covered very well.

I would like to make one point that I feel possible is not clear, and that is that if we do go to airway flying at the present time it would not provide the positive separation or the positive control, whichever you prefer to use, inasmuch as so much of our regulation now under IFR flight plans is based on the see and be seen principle.

I refer to such things as an IFR flight plan with a thousand on top clearance. Essentially the control is now in the cockpit on the see and be seen principle.

I refer also to clearances that you might receive on an IFR flight plan where airways traffic control will put a VFR restriction on your climb.

For example, during that segment of your climb the control is now back in the cockpit and on the see and be seen principle. And beyond the structural limitations that restrict the visibility in our present airplanes, we do have the human factor, which I think has been brought out in the last few years, that a human being just does not maintain constant vigilance for just more than a few minutes, unless he is looking at something that is attracting his attention.

Also, in looking into space, you have no depth perception. It has been said that possibly your eyes are focusing only 6 feet ahead of you and you don't realize this.

Also, under our present regulations, which permit VFR in 3 miles, very shortly we will be encountering closure rates of 1,200 miles an hour. This means 5 miles in 15 seconds or 2½ miles in approximately 7 seconds. That is here today, actually, with our military jets. And I think that we should look very closely to eliminating any see and be seen principle in our regulations when we do think of positive control or positive separation.

Mr. HARRIS. In other words, you think we should go to that type of flying?

Captain LOVETT. Yes. We have got to establish our control by means other than the ability of the pilot to see out the windshield.

Mr. HINSHAW. Mr. Chairman?

Mr. HARRIS. Mr. Hinshaw.

Mr. HINSHAW. I would like to ask this gentleman a question having to do with this accident directly, and a matter of company policy.

We understood in Las Vegas that the United pilot involved in this accident had last made a contact with Needles communications station and that he was instructed by the company, or it was the custom of the pilots, to contact airway stations as they went along for reporting and for instructions; whereas, in TWA, it seems to be the policy of the company or of the pilots, I don't know which, to contact the company for airways instructions and for enroute information.

Now, am I wrong or right, as far as United is concerned?

Captain LOVETT. United's policy in that respect is that we do use the company radio if the particular station that we are talking to has a direct interphone to the airway traffic control center of the area you are in.

However, if you are off airways and are talking to a United operator, for example, when we are in, we will say, the Pittsburgh area we have no direct interphone with our ground stations to Pittsburgh. So in those areas we do work directly with the airway stations or direct to the airway traffic controller himself.

But in all cases we do work either through the interphone connection through our company or directly with INSAC.

Mr. HINSHAW. Let's talk about this event.

The man last contacted Needles for a position report, or to make a position report, and that was relayed to Salt Lake because he was in the Salt Lake control area, and no longer in the Los Angeles area and not in the Albuquerque area. Is that correct?

Captain LOVETT. That should be true, yes.

Mr. HINSHAW. To your knowledge, does the record show that?

Captain LOVETT. I am not familiar with the record of the operations committee. In fact, they are still in the process of writing detailed reports on that now. That will be shown in the CAB operations committee report.

Mr. HINSHAW. What segment of United do you fly?

Captain LOVETT. I fly east out of Denver to New York.

Mr. HINSHAW. What?

Captain LOVETT. East out of Denver.

Mr. HINSHAW. Have you flown the Los Angeles sector?

Captain LOVETT. I have flown it on occasion.

Mr. HINSHAW. But it is not familiar to you?

Captain LOVETT. Not intimately; no, sir.

I do know that on that route we do not have VHF communications network. That is, the United Air Lines communications network on occasions is very difficult to read on the VHF network. In those cases we do work INSAC on that area.

We work the airways stations in that area as a result of radio interference on the high frequency circuits.

Mr. HINSHAW. It is also noted that about that point there intersect the boundaries of three areas of airway traffic control. It shows on one of these maps, which I do not have before me, that the Los Angeles control area is just outside, I believe, of Needles where it transfers to Albuquerque, and just north of there and before you reach Lake Mohave, it is in the Salt Lake area. In other words, we have a three-zone point. Is that correct?

Captain LOVETT. That sounds correct, yes. I am not precisely familiar with that but I know that is generally true.

Mr. HINSHAW. So that if one goes off airways into uncontrolled territory at that point, there is a cross communication.

Captain LOVETT. That is true.

Mr. HINSHAW. And in this case it is all the way to Salt Lake and back, which is rather cumbersome, I should think.

Captain LOVETT. It is.

Mr. HINSHAW. And also complicated, particularly in view of the amount of traffic.

I wish that you would examine the situation and be prepared to have somebody report from, I think, your pilots committee as to whether or not it is advisable to raise northward the line of division between the Albuquerque control zone and the Salt Lake control zone, to include in the Albuquerque control zone that portion of the Albuquerque air defense identification zone in the Albuquerque zone of control of aircraft, and on a line from thence over to some point north of the Grand Canyon, thereby placing the entire Grand Canyon area and the Albuquerque air defense identification zone within the same airways control zone.

Captain LOVETT. In our meeting on Monday and Tuesday, that can be brought up with our traffic control group, and that would be passed on to them.

Mr. HINSHAW. It seems to me positively ridiculous that a plane leaving from the Los Angeles area and headed almost due east should have to go into the Salt Lake control zone for its instructions at any point in its traffic.

If it is coming from San Francisco, I can see it. Or if it is going northeastward, I can see that it should enter it. But if it is going eastward, I cannot see it; I am sorry.

And I wonder if examination of that might not bring something out of value.

It is recognized, of course, that this Albuquerque air defense identification zone has high-powered radar. In the report of 1948 of the Congressional Aviation Air Policy Board, it was strongly recommended that an Air Defense Command be set up at that time, and that this Air Defense Command in its radar coverage be coordinated very closely with airways traffic control, both for national defense purposes, and increasing the positiveness of airways traffic control.

I do not believe that that has been done except on a one-way basis, and that is from airways into the ADIZ.

Possibly some, let us say, practice could be given to the ADIZ by operating through airways traffic control with ATC on aircraft within range of the radar.

Captain LOVETT. I believe we have considerable radar in this country that could be used immediately to alleviate the problem as to what we are going to do tomorrow.

I think we all know what we need in 3 to 5 years. It is the man that is going to fly tomorrow that I think is worried. I think that is one approach to it.

I think possibly our present structure of airway traffic control could be reviewed to see if we are utilizing it up to the maximum. I think in some cases we are not.

That could possibly provide a small amount of alleviation.

Mr. HINSHAW. It certainly is very thin. And this might serve as a means of thickening up the thin spots and giving practice to those who are engaged in air defense.

Captain LOVETT. That is correct.

I think particularly of our north and south radials, or Victor Airways. I think they could be used possibly a little more than they are at the present time.

I think of occasions of where here has been a holdup in descents of trips and suggestions have come from the pilot to the controller on the ground that they would accept a north airway or a south airway to provide a lateral separation, in which case the trip has been cleared that way, showing that the control centers were not using the facilities they did have to the full extent possible.

Mr. HINSHAW. Certainly the different agencies of Government have not implemented fully by any means the coordination which they could and which they have the capability of doing at the present time. And that in itself could prove a boon to traffic control and hence air safety; could it not?

Captain LOVETT. That is very true?

Mr. HINSHAW. That is all.

Mr. HARRIS. Are there any further questions?

Did you have anything further, Captain?

Captain LOVETT. No, sir; that was all.

Mr. HARRIS. Thank you very much. We are glad to have had your statement here.

We have also Mr. Ross Kinkel, United Air Safety Chief, Los Angeles, Calif.

Captain LOVETT. Pardon me.

Mr. Kinkel is also a member of the Central Air Safety Committee. He is in Los Angeles on one of the accident-investigating teams for the United group.

Mr. HARRIS. Very well. We wanted the record to show that.

I observe that we have, according to my report here, Capt. Will Hunt from American Airlines. Is Captain Hunt here?

Obviously Captain Hunt is not here.

I want the record to show also the presence of Mr. Frank Dubbs, of TWA.

Captain DUBBS. I am present, Mr. Harris.

Mr. HARRIS. Do you have any further statement that you wanted to make?

STATEMENT OF CAPT. FRANK DUBBS, TRANS WORLD AIRLINE PILOT

Captain DUBBS. There was just one point, gentlemen, that was not brought out regarding the utilization of local control zone radar scopes which operate presently on an 8- or 16-hour-a-day basis, and which are idle for a period of 8 or 16 hours due to insufficient number of personnel.

I have one particular geographical location in mind where an accident possibly could have been averted had sufficient personnel been on duty to man this scope had it been turned on.

Mr. HARRIS. That is what position, now? Air safety?

Captain DUBBS. That is a control zone or an airport, if you please, in the greater Cincinnati area, where a few months ago, a year and a half to 2 years, there was a collision between 2 airplanes, one a privately owned aircraft and one a TWA aircraft.

We are told that there was a radar scope at that location but the accident occurred sometime in the wee hours of the morning, and that scope was not in operation. It had not been set up to be in operation at that time of the day, week in and week out, due to the lack of personnel at that station.

I give that one concrete example. There are, from what we learn in talking to our operators and our controllers, other such situations.

Mr. HARRIS. Is that position referred to around these airports as the air-safety agent?

My attention has been called to a reduction in personnel at airports in what were referred to as air-safety agents. Do you know what that means?

Captain DUBBS. I am not familiar with that, sir.

Mr. HARRIS. I think we will have some witnesses here from some of the airports in connection with that.

I understood that, in those positions, actually they had 5 at 1 time in the airport at Memphis and now they do not have any. They bring them in from, I understood, Jackson, Miss., or Nashville, Tenn., or as far away as Dallas.

So I was wondering if you knew just what that position was.

Captain DUBBS. No, sir; I don't.

Mr. HARRIS. Thank you very much, Mr. Dubbs.

Captain DUBBS. Thank you, Mr. Chairman.

Mr. HARRIS. Is Mr. William Merrigan present?

Captain MERRIGAN. Yes, sir.

Mr. HARRIS. Mr. Merrigan, do you have any statement?

STATEMENT OF CAPT. WILLIAM MERRIGAN, CHAIRMAN, MASTER EXECUTIVE COUNCIL, TWA PILOTS ASSOCIATION

Captain MERRIGAN. I will identify myself. I am William Merrigan and I am chairman of the master executive council, TWA pilots. That is an elected office for the TWA pilots in the ALPA.

I was not a member of the committee. However, I was in touch with the fellows out at the canyon site almost daily and I do not believe I could add anything to what has already been said.

I concur pretty well with all of the recommendations made, but the thing that we are most interested in is tomorrow, and for today, to keep it from happening again.

One thing that has been kicked around a lot, and I guess there has been a contract let for it, is the proximity indicator. The Utopia might be with the ground surveillance radar, and also the radar in the airplane, with some sort of a proximity indicator attached to it, with a warning or signal or something.

When that will come, I do not know. That is still in the development stage. And expansion of the ground radar would help a lot.

Mr. HINSHAW. You would not expect anything on the proximity indicator to be visible except at the same altitude, because otherwise it would be ringing all the time and you would not be in danger.

Captain MERRIGAN. The specifications that are drawn up for it would have to have certain provisions where it would not sound an alarm unless there was danger of collision or something like that. You would not want them going off all the time; no.

Mr. HINSHAW. Otherwise, you would have one of those "wolf" "wolf" deals. You would have to have quite specifically the closure rate and the likelihood of collision in a particular direction.

Captain MERRIGAN. We believe, from the number of pilots I have talked to, that the ultimate is some sort of an airborne radar to provide traffic separation so you will eliminate the third party and the communications lag.

Even though you have surface radar, the ultimate solution is some type of airborne radar, and to the best of my knowledge it is presently not available.

Mr. HINSHAW. That would be transferring to the cockpit the responsibility for traffic separation in a good many directions that the other pilot might not be aware of. You would have just as much confusion on that score as you do by having radar on the ground.

Captain MERRIGAN. We want the radar on the ground as a means of assistance. We need it. We want the separation. But the ultimate decision for moving of the controls or taking the action must come from the cockpit.

We think that we should have a monitor, if you will, or we should have something in the airplane available to us as a further check on any human breakdown or relying on information and things of that sort.

Mr. HINSHAW. Mr. Chairman, I do not know whether the present radar is a competent device for the purpose, but if we could get radar which would detect both precipitation and aircraft, it would be pretty good; wouldn't it?

Captain MERRIGAN. We would have it made, with a 360° sphere to see all around.

Mr. HARRIS. What did you say your position was? With what committee?

Captain MERRIGAN. I am the master chairman for the TWA pilots.

To break it down so that you will understand it, we have committees under us. Mr. Halperin is the chairman of our air safety committee,

which is under the master executive council. It is the top ALPA organization for our airline. I am the chairman of that committee.

Mr. HARRIS. Thank you very much.

Captain MERRIGAN. Thank you.

Mr. HARRIS. Mr. Herb Broderick? Is Mr. Broderick here?

I have his name showing that he would be present. I wanted the record to show that.

Is there anyone else here whose name I might not have called?

Captain MERRIGAN. Mr. Harris, if I may, I have a quote here from a letter from a top elected official of the Air Line Pilots Association to the chief executive of his airline, the closing paragraph.

This is dated on March 23 of this year, in reference to new aircraft. It is basically what I have said, but I would like to read it for you, if you will permit. It will only take a couple of minutes. He says:

> On another subject, our most competent pilot thinking in the field of traffic separation and collision prevention tends to airborne radar. We recognize that it must be tied in with adequate ground control, but communication and identification lag is intensified at high speed and reliance on ground control maintains the opportunity for error by a third party. Political pressure by private flying interests for maintenance of so-called VFR privileges seems to make it mandatory that the airlines provide their own airborne protection. The certain increase in helicopter operation will intensify an already present terminal hazard.

I wanted to read this to show that we have been thinking in this line of airborne radar for some time, and we think that it is the ultimate solution.

Mr. HARRIS. Has that been developed for commercial use?

Captain MERRIGAN. The airborne radar?

Mr. HARRIS. Yes.

Captain MERRIGAN. There is in the June 18 issue of Aviation Week a little excerpt under Industry Observer that there is a team in Los Angeles that had come up with a device they thought would be the proper type for this and they had asked ATA to finance it. They at that time had been turned down, or, according to Aviation Week, there was some reluctance on the part of the Air Transport Association to finance anything of that order.

Mr. HARRIS. But as of the moment, it is not developed?

Captain MERRIGAN. That is right.

We believe that possibly they have been dragging their feet a little on it. It could have been that it could be developed.

Mr. HINSHAW. Captain Merrigan, that poses a very interesting question, and that is whether only the fourteen or fifteen hundred planes in the air carrier service should be required to operate with radar installed and allow all of the other forty or fifty thousand to go without them?

Of course, I realize that passengers are aboard the air carrier aircraft and sometimes aboard the others, occasionally. But the other aircraft, in order to not run wild, should be likewise equipped; should they not?

Captain MERRIGAN. I would certainly think it would be most satisfactory if they were.

Mr. HINSHAW. And the cost of development should not be borne by a single group of those aircraft. There are 18,000 business and professional aircraft that are frequently of a carrier type.

Captain MERRIGAN. When I said they are dragging their feet, I did not mean to infer any particular group. I might say we are dragging our feet, all of us. We have not at this time pushed it to the point where it was developed, and we do here, or we believe it can be developed.

Mr. HINSHAW. It is quite possible this development can be best carried on either in the Commerce Department or the Defense Establishment, but maybe not quite so quickly as it could otherwise. But certainly, if they had it, if they had a prototype of it, or the beginnings, the one preceding a prototype, it ought to be developed, and quickly.

Captain MERRIGAN. We believe it should be pushed.

Mr. HINSHAW. We would be very much interested to hear about it in the committee, I am sure, and very much interested in doing what we can to promote it.

Mr. HARRIS. Thank you very much.

This concludes the hearings for today.

I might say that it is the intention at the early part of next week, perhaps Tuesday, if the business of the committee and of the House will permit, to have the representatives of the Weather Bureau here for some information we have been trying to get today, and then to arrange, following that, to have representatives of both the Civil Aeronautics Board and the Civil Aeronautics Administration to appear before the committee to answer a number of questions that we have in mind, including a full and complete explanation of the airways throughout the United States.

I will make that statement so that anyone who is interested might know what we have in mind.

Let me thank each of you for coming here and for the contribution you have made to the hearings.

The committee will adjourn.

(Whereupon, at 4:45 p. m., the committee was recessed, subject to the call of the Chair.)

AIRSPACE USE STUDY

TUESDAY, SEPTEMBER 11, 1956

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE
ON TRANSPORTATION AND COMMUNICATIONS
OF THE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D. C.

The subcommittee met at 10 a. m., pursuant to notice, in room 1334 of the House Office Building, Hon. Oren Harris (chairman of the subcommittee) presiding.

Mr. HARRIS. The subcommittee will be in order.

This meeting this morning is to resume hearings in connection with aviation policy and matters affecting aviation in the United States. Among the items to be considered, of course, is the continuation of the hearings on air safety and airspace utilization, a study which was undertaken by the direction of the full committee following the tragic incident over Grand Canyon June 30 of this year, in which 128 persons lost their lives, in what has been considered the worst commercial air disaster in the history of our country.

Since we held our last hearing on July 18, we observed the Civil Aeronautics Board, charged by law with the responsibility of determining the probable cause of civil air accidents, has made a thorough investigation of the Grand Canyon tragedy. It has held extensive public hearings to determine the cause of the accident. No doubt the Board will publish its findings and determine the probable cause of the accident in the near future so that we need not go further into extensive details of the accident here at this time.

However, the record should be made by this subcommittee and inasmuch as we have asked the Weather Bureau of the Department of Commerce to prepare certain data for the committee it will be included in the record at the start of the hearings today. This is information which would have been submitted at earlier hearings but which had to be canceled, as you will recall, because of the press of legislative business in the closing days of the session of Congress.

Following the Weather Bureau data, the committee will hear an outline of the procedures followed by the Civil Aeronautics Board in making air traffic regulations so important in the prevention of accidents such as the one over the Grand Canyon. The Civil Aeronautics Administration will outline its part in the rulemaking process, and explain its enforcement procedures. Undoubtedly this testimony will raise issues which may have to be resolved by legislation. Of course, that will be determined as we go along.

The Civil Aeronautics Administration will also present data on our vast civil airways and the air traffic control system and also explain

the problems of operating the system to provide the maximum safety for commercial and military aviation.

I might say in connection with that presentation, it will be highly desirable if the CAA will present us a map in order that we may see the airways of the country and have them explained to us, and also a map which contains stations and other data of our traffic control system. We believe that this graphic explanation will help us to understand the problem much better.

We understand that certain problems have been encountered in an effort to get the Civil Service Commission to provide better pay for people who have the difficult and trying task of operating our complicated airway systems too. That will be gone into at the proper time and, of course, whenever it is appropriate we would like it to be presented in connection with these hearings.

Also, I might say that in connection with the hearings we held last year on the air navigation aids, I am advised that a complete unanimity of thought and action has been reached by the Air Coordinating Committee and all of the agencies of our Government involved, and also with the civil and commercial aviation industry. That program will be presented to us on Thursday by the chairman of the Air Coordinating Committee supported by representatives of the industry, the Air Transport Association, and very likely the military, who are members of the ANDB. That certainly, to me and to the members of the committee, I know, is good news.

I think in my experience on this committee in wrestling with controversial problems, the controversy over the complicated proposal of air navigation aids has been one of the greatest. It appeared to us a year ago that there was no easy solution and very likely it would be a long, long time before the problem would be settled. There were other complications between our civilian and military life.

Earlier in this year we endeavored to bring the viewpoints of the various parties together and we were told in May that they thought they could get together. In June we were told that it was very doubtful that there could be a meeting of the minds in the near future. To our satisfaction, we understand now the problem has been resolved and an explanation of this new device will be given. It will be sponsored by Government agencies and, I understand, the civil aviation industry. It is called VORTAK, and I assume from what I have been told that efforts will be made to substitute this for the VOR-DME system.

I think before we hear the first witness, I may say at this point, and I know I speak the sentiments of members of this committee and everyone here and Members of the Congress and the aviation industry and a great many people throughout the United States, that since we last met and since the Congress adjourned we lost one of our most valiant and able members of the committee and Member of Congress, Mr. Carl Hinshaw, of California. We cannot keep from reflecting here this morning, because he has been with this committee so long, and because we admired him and respected him so highly and loved him as a members of this committee and because he is recognized as not only an able Member of Congress but probably the most outstanding advocate of the Congress in the field of aviation. We miss him today, and we will miss him in the future, and I am sure that an ap-

propriate tribute will be paid when the full committee meets in the next session of the Congress.

I might also note at this point that since we left the Administrator of the Civil Aeronautics Administration has passed on to his reward. That, too, is a great loss in our Government service, and I know that his place will be hard to fill. I know that his service that he had actually just entered into, to its fullest import, will be missed in the administration of this great program.

The program that I have indicated or outlined will be a consideration of these hearings, together with a full description of the plans for the future of the Government agencies, particularly on our airways and control programs, which I understand has been reduced from 5 to 3 years. We hope also to hear of the program as it has progressed with reference to our airport construction which is so vital to the future of aviation.

I intended to read this wire for the record from our distinguished chairman of the committee:

My commitments here—

in Nashville, Tenn.—

are such that I will not be able to attend the subcommittee meetings beginning on September 11.

J. PERCY PRIEST.

There is another wire received from a member of this committee that might be of interest, also:

Our State election day today. Expect to arrive Washington 1 p. m. tomorrow in time for afternoon committee session.

ROBERT HALE.

Mr. HARRIS. In the first place, we will receive the data from the Weather Bureau, and hear Mr. Arthur C. Peterson, who is the Chief, Domestic Aviation Section of the United States Weather Bureau here in Washington.

Mr. Peterson.

STATEMENT OF ARTHUR C. PETERSON, CHIEF, DOMESTIC AVIATION SECTION, FORECASTS AND SYNOPTIC REPORTS DIVISION, UNITED STATES WEATHER BUREAU, WASHINGTON, D. C.

Mr. PETERSON. Do you wish first to receive the data?

Mr. HARRIS. We would like very much for you to present this information to us, Mr. Peterson, as scheduled.

Mr. PETERSON. I would like to read a statement, if I have your permission, Mr. Chairman. I have a few charts here. I would like to just point to them as I read the statement and perhaps it will help clarify the contents.

Mr. HARRIS. Very well, you may do that.

Mr. PETERSON. This is a statement of weather on June 30, 1956, along the Los Angeles-Grand Canyon air routes as forecast and reported by the United States Department of Commerce, Weather Bureau.

I am appearing here at the suggestion of Dr. F. W. Reichelderfer, Chief of the United States Weather Bureau, in response to the letter of July 19, 1956, from the chairman of this subcommittee. The

Bureau realizes the importance of this investigation and desires to assist the subcommittee in every way possible.

This statement concerns the weather of June 30, 1956, as reported by and to the Weather Bureau, and as forecast by the Weather Bureau, for the air routes from Los Angeles, Calif., to the Grand Canyon area of Arizona as related in time and space to the flights of Trans World Airlines flight 2 and United Air Lines flight 718. Exhibits of pertinent weather charts, forecast, and reports in support of this statement are listed in the attachment.

The crew of neither of these flights was briefed on the weather by the Los Angeles Weather Bureau Airport Station prior to their departure from the Los Angeles International Airport. Although such briefing service is available at all Weather Bureau airport stations, airline operations offices usually provide briefings for their own crews. To do this the airlines obtain Weather Bureau reports and forecasts which are available to them on the national weather teletypewriter circuits. Some airlines maintain their own weather forecasting staffs. This is true of both TWA and UAL.

Surface weather maps of June 30 show a broad trough of low pressure extending from Minnesota southwestward to the southwestern border of Nevada. The main low-pressure center was situated east of the Rockies and moved slowly eastward. A second low-pressure center was situated along the Nevada-California border. This low center was essentially a thermal or "heat" low, semipermanent in character, and remained nearly stationary. A cold front extended from the low center east of the Rockies to central Colorado and thence westward through central Utah and central Nevada. Although there were slight oscillations of this front, it remained well to the north, 200 miles or so, of the Grand Canyon area.

The air through the lower Colorado River Valley was becoming increasingly moist at the surface and upper levels. The upper air flow through southern Arizona was predominantly southerly in the lower levels becoming southwesterly at higher levels, and in northern Arizona this flow curved to southwesterly in the lower levels and westerly in the upper levels. The moisture content was sufficient to expect the development of scattered afternoon thunderstorms, particularly over the higher terrain of central, northern, and eastern Arizona.

Forecasting responsibility for the air routes involved is shared by the Weather Bureau's Flight Advisory Service (FAWS) centers located at Los Angeles, Salt Lake City, and Albuquerque. Los Angeles FAWS is responsible for the southern California portion, Salt Lake City FAWS for the southern Nevada portion, and Albuquerque FAWS for the northern Arizona portion. Each FAWS area of responsibility throughout the country corresponds closely with the areas of responsibility of the respective Air Route Traffic Control (ARTC) centers of the Civil Aeronautics Administration.

Applicable portions of the forecasts issued on June 30, 1956, by these FAWS centers follow:

By Los Angeles FAWS:

Area forecast valid 0600 m. s. t. to 1800 m. s. t.

Southern California: All heights above mean sea level.

Coastal section: 1,200 to 1,500 feet broken variable to overcast clouds, visibility unrestricted, tops of clouds, 1,500 to 1,800 feet with frequent large clear

areas. Stratus clouds becoming generally 1,200 to 1,400 feet overcast, visibility 5 miles in haze by 0700 m. s. t. and dissipating rapidly after sunrise to clear skies and unrestricted visibility by 1000 m. s. t.

Mountain areas: Clear skies and visibility unrestricted with few scattered clouds at 7,500 feet with tops to 18,000 feet and with chance of isolated showers San Bernardino Mountains southward during the afternoon.

Desert area: Clear skies and unrestricted visibility except a few patchy alto cumulus clouds near 15,000 feet southern deserts. Antelope Valley surface winds locally west-southwest 18 knots with gusts to 25 knots during the afternoon and surface winds Imperial Valley northward to Thermal locally south-southeast 12 knots with gusts to 18 knots during the afternoon.

Mr. HARRIS. Is that the area around the Grand Canyon?

Mr. PETERSON. No; this portion of the forecast deals with southern California.

Winds aloft forecast valid 0800 m. s. t. to 2000 m. s. t.

Los Angeles:
15,000 feet: 300° 12 knots
20,000 feet: 260° 20 knots
Beaumont:
15,000 feet: 300° 12 knots
20,000 feet: 260° 20 knots

Mr. DOLLIVER. What do you mean by degrees?

Mr. PETERSON. That is the compass reading—360° would represent north, and 90° represents east, and so on.

Mr. WILLIAMS. Would that explain why both of those pilots wanted to use the same altitude with favorable winds: 260° at 20 knots?

Mr. PETERSON. I would doubt if there was that much difference in the winds, sir, as they extended aloft. They were favorable at all altitudes.

Mr. WILLIAMS. That was virtually a tailwind?

Mr. PETERSON. It is almost right on the tail; yes, sir.

By Salt Lake City FAWS:

Area forecast valid 0600 m. s. t. to 1800 m. s. t.

Southern Nevada: All heights above mean sea level. Scattered, variable to broken, clouds with bases 13,000 feet and tops to 35,000 feet with a few thundershowers in morning becoming scattered thundershowers in afternoon with a few bases locally 10,000 feet and tops 40,000 feet. Locally moderate icing in heavy cumulus and cumulonimbus clouds above freezing level at 15,000 feet. Moderate to locally severe turbulence near heavy cumulus clouds and thundershowers.

Winds aloft forecast valid 0800 m. s. t. to 2000 m. s. t.:

Las Vegas, Nev.:
15,000 feet: 270° 15 knots
20,000 feet: 260° 20 knots

By Albuquerque FAWS:

Area forecast valid 0600 m. s. t. to 1800 m. s. t.

Northern Arizona: All heights above mean sea level. Scattered clouds at 8,000 feet and broken, variable to overcast, clouds at 11,000 feet with scattered showers and thunderstorms. Tops of thunderstorms 30,000 feet or higher. Conditions improving to about 12,000 feet broken clouds by 1200 m. s. t. but with scattered showers and thunderstorms continuing. Gusty surface winds in vicinity of thunderstorms to about 30 to 35 knots. Moderate icing in showers and thunderstorms above freezing level at 15,000 feet. Moderate to severe turbulence in vicinity of showers and thunderstorms.

Winds aloft forecasts valid 0800 m. s. t. to 2000 m. s. t.

Winslow:
15,000 feet: 240° 15 knots
20,000 feet: 240° 15 knots

Actual weather as reported by surface observation stations along the air routes and disseminated on the teletypewriter weather circuits is summarized as follows: At 1000 mountain standard time there were thin broken clouds at 1,600 feet in the Los Angels area, with haze and smoke limiting the visibility to 4 miles. This improved soon after to scattered clouds with visibility 10 miles. From the coastal mountains to the Colorado River skies varied from clear to scattered clouds at 14,000 feet to 18,000 feet above sea level. From the Colorado River Valley to the higher terrain of central and northern Arizona cloudiness increased to generally broken, variable to locally overcast. Prescott and Flagstaff, to the south of the TWA and UAL flight routes, had reported showers and thunderstorms prior to 0900 mountain standard time. At 1028 mountain standard time and 1128 mountain standard time, these stations reported as follows:

1028 mountain standard time:

Prescott: 3,500 feet scattered, 14,000 feet scattered, visibility 40 miles, wind southeast 7 knots, cumulonimbus and towering cumulus clouds in distance all quadrants.

Flagstaff: 200 feet scattered, ceiling estimated 3,000 feet broken, 10,000 feet overcast, visibility 15 miles, wind south-southwest 10 knots, breaks in overcast to the southwest, mountains north obscured.

1128 mountain standard time:

Prescott: Ceiling estimated 3,500 feet broken, 14,000 feet broken, visibility 40 miles, wind southeast 8 knots.

Flagstaff: 800 feet scattered, 3,000 feet scattered, ceiling estimated 10,000 feet broken, visibility 15 miles, wind west-southwest 13 knots.

The nearest station to the Grand Canyon area that reports weather on an hourly basis is Flagstaff. However, there is a 3- and 6-hourly reporting station at the town of Grand Canyon whose reports are also disseminated on the teletypewriter circuits. The 1121 mountain standard time Grand Canyon report is as follows:

Ceiling estimated 7,000 feet overcast, visibility more than 15 miles, wind southwest 6 knots, past weather (4 to 5 hours prior to 1121 mountain standard time) thunderstorm, precipitation within past 6 hours 0.05 inch.

There are three climatological reporting stations in the Grand Canyon area where a single observation is made at 1700 mountain standard time daily. These reports are logged on a form and submitted to the Weather Bureau at the end of each month. These stations reported as follows:

Inner Canyon Station (located on the floor of the Canyon, 3.7 miles northeast of Grand Canyon Post Office) reported no precipitation on June 30, 1956.

Bright Angel Ranger Station (located near the edge of the north rim of the Grand Canyon, 9 miles north-northeast of the post office) reported 0.24 inch precipitation between 1500 mountain standard time and 2400 mountain standard time on June 30, 1956.

That would be after the accident.

Mr. WILLIAMS. Where are these stations with respect to where this accident occurred?

Mr. PETERSON. They are to the west of the confluence of the Little Colorado and the Colorado Rivers.

Mr. WILLIAMS. Approximately how far away from the scene of the accident?

Mr. PETERSON. The Inner Canyon Station is directly down from the headquarters of Grand Canyon Junction itself, the main resort area of the Grand Canyon.

Mr. WILLIAMS. How far away in miles?

Mr. PETERSON. I would say about 15 to 20 miles.

Headquarters station, National Park Service (located in the town of Grand Canyon and just east of the post office) reported 0.33 inch precipitation between 1700 mountain standard time, June 29, and 0500 mountain standard time, June 30, 1956.

That would be before the accident.

Because of the distance between surface weather reporting stations, pilot reports of weather are relied upon to determine the various types of weather between stations. Also, pilot reports are the only source of information on cloud tops, turbulence, and icing. Most of the pilot weather reports received on June 30, 1956, pertain to air routes other than those flown by TWA flight 2 and UAL flight 718. However, a significant postflight weather report was received from American Airlines flight 918 which was en route via Las Vegas, Nev., to Dallas, Tex., on June 30, 1956, and was over Winslow, Ariz., at 1157 mountain standard time. This postflight report follows:

Las Vegas to east end of Lake Mead was CAVU. East end of Lake Mead to 20 miles west of Grand Canyon Junction we were on top of scattered clouds at 19,000 feet with tops estimated 15,000 feet. We flew south of the town of Grand Canyon Junction and saw the Grand Canyon Airport below us through breaks. One large cumulo-nimbus type build up directly over the town of Grand Canyon Junction and radar indicated several more cumulo-nimbus clouds with active cells to northeast, so we headed straight to Winslow in the clear, on top, and requested ARTC clearance through Winslow Radio (CAA)—which we received about 8 minutes before reaching Winslow OMNI. There were many layers of stratus clouds with scattered thunderstorms from Winslow to Albuquerque. We had to detour a few miles north of Grants account of active cell over Grants showing on radar.

En route between Grand Canyon Junction airport and Winslow we were able to see the Little Colorado River and the Painted Desert area about 70 miles northwest of Winslow through an area of no clouds just west of the frontal area. The ground was wet in several areas indicating recent rainfall.

Another significant pilot postflight report, obtained through the courtesy of the Civil Aeronautics Board, was made by Messrs. Palen Hudgin and Henry Hudgin who flew scenic trips over the Grand Canyon on June 30, 1956. The weather portion of their report is quoted as follows:

Weather conditions over Grand Canyon from 8:30 a. m. until 1 p. m. were: Early in the morning cloud base was 9,000 feet m. s. l. and gradually raised to 9,500 feet m. s. l. by 1 p. m. There were a few breaks in the clouds through which clear sky could be observed above. Through the breaks the tops appeared to be about 12,000 feet m. s. l. There were no showers or thunderstorm activity in the area and the clouds were light in color with no visible dark spots underneath, indicating that probably there was little or no buildups on top.

Scenic flights were made over the canyon from about 8:30 a. m. until 12:40. Visibility beneath the clouds was excellent.

Another pilot weather report is pertinent to the Grand Canyon area, but the time is several hours after the accident. This report follows:

Observation time, 1700 m. s. t.: Flight en route from Park, Ariz., south to North Rim Grand Canyon, heavy thunderstorm activity 40 miles wide with heavy rain. Tops to 31,000 feet above mean sea level and building.

Attached to this statement is a list of 22 supporting documents, which give the technical details. I will be glad to answer questions on them or to discuss further these charts, as you wish.

Mr. HARRIS. I think the list of weather exhibits should be included with the statement, but not the exhibits themselves. This is the list here.

Mr. PETERSON. Yes.

(The list referred to follows:)

LIST OF WEATHER EXHIBITS

1. Statement of meteorologist in charge of Weather Bureau airport station at Los Angeles concerning preflight briefing of TWA flight 2 and UAL flight 718 flight crews
2. Surface weather chart (4), North American, for 0530 m. s. t., 0830 m. s. t., 1130 m. s. t., and 1430 m. s. t., June 30, 1956, as prepared by the National Weather Analysis Center, Washington, D. C.
3. 500 millibar (about 20,000) pressure contour charts (3), for 2,000 m. s. t., June 29, 1956, m. s. t., June 30, and 2000 m. s. t., June 30, 1956, as prepared by the National Weather Analysis Center, Washington, D. C.
4. Winds aloft charts for 8 levels up to 20,000 feet for 0200 m. s. t., 0800 m. s. t., and 1400 m. s. t., June 30, 1956, as prepared by the National Weather Analysis Center, Washington, D. C.
5. Pseudo adiabatic charts for 0800 m. s. t., and 2000 m. s. t., June 30, 1956, for Tucson, Phoenix, and Las Vegas
6. Map showing aviation weather forecast areas and FAWS centers of the Weather Bureau
7. Aviation area forecast, valid 0600 m. s. t., June 30, 1956, and winds aloft forecasts, valid 0800 m. s. t., June 30, 1956, issued by Los Angeles FAWS
8. Winds aloft forecast valid 0800 m. s. t., June 30, 1956, and aviation area forecast valid 0600 m. s. t., June 30, 1956, issued by Salt Lake City FAWS
9. (*a*) Aviation area forecast valid 0600 m. s. t., June 30, 1956, issued by Albuquerque FAWS
   (*b*) Winds aloft forecasts valid 0800 m. s. t., June 30, 1956, issued by Albuquerque FAWS
10. Teletypewriter sequence weather collections from service A, circuit 9, hourly from 0728 m. s. t., through 1428 m. s. t., June 30, 1956.
11. Teletypewriter sequence weather collections from service A circuit 12, hourly from 0728 m. s. t., through 1428 m. s. t., June 30, 1956.
12. Lists of weather station names, call letters, and elevations for—
    (*a*) Service A circuit 9
    (*b*) Service A circuit 12
13. Form TA 631–0–1 Explanation of Teletypewriter Weather Reports
14. Card form—Key to Aviation Forecasts
15. Surface weather observations, copies of original records entered on form WBAN 10A, June 30, 1956, for the following stations:
    (*a*) Los Angeles, Calif.
    (*b*) Las Vegas, Nev.
    (*c*) Prescott, Ariz.
    (*d*) Flagstaff, Ariz.
    (*e*) Winslow, Ariz.
16. Surface weather observations, copies of original records entered on form WBAN 10 (CAA), June 30, 1956, for the following stations:
    (*a*) Palmdale, Calif.
    (*b*) Daggett, Calif.
    (*c*) Needles, Calif.
    (*d*) Cedar City, Utah
    (*e*) Bryce Canyon, Utah
17. Surface observations, Grand Canyon, Ariz., for June 30, 1956:
    (*a*) WB form 610.6–1, copy of original record of 6-hour synoptic observations
    (*b*) WBAN 10, copy of original record of 3- and 6-hour surface observations
    (*c*) WB form 1068C, copy of original barograph trace June 29 to July 1, 1956

18. Record of climatological observations, WB form 1009, for month of June 1956 for following stations:
    (*a*) Inner Canyon Station, Ariz.
    (*b*) Bright Angel Ranger Station, Ariz.
    (*c*) Headquarters, Grand Canyon National Park, Ariz.
19. Statements of pilot weather reports received at the following Weather Bureau stations on the afternoon of June 30, 1956:
    (*a*) Prescott, Ariz.
    (*b*) Flagstaff, Ariz.
    (*c*) Las Vegas, Nev.
    (*d*) Winslow, Ariz.
20. Statement of postflight weather report by American Airlines flight 918, of June 30, 1956, submitted to the Weather Bureau airport station at Los Angeles
21. Summary and aftercast of weather conditions morning and early afternoon of June 30, 1956, submitted by Eldred O. Mox, aviation forecaster, Weather Bureau airport station, Albuquerque, N. Mex.
22. Statement of Pilots Palen and Henry Hudgin to the Civil Aeronautics Board concerning weather over Grand Canyon on June 30, 1956

Mr. PETERSON. I have a complete set of these listed exhibits available.

Mr. HARRIS. Let them be filed with the committee for our use and benefit, but I think it would be difficult for those charts and so forth to be included in the record, and so we will receive them for the files.

Does that conclude your statement?

Mr. PETERSON. Yes, Mr. Chairman.

Mr. HARRIS. Are there any questions?

Mr. WILLIAMS. Both of these planes, as I recall it, were due to cross this line known as the Painted Desert at a certain hour, at the same time, as I recall.

Mr. HARRIS. It was 11:31 when the accident occurred.

Mr. WILLIAMS. On the basis of all of the reports that you have, what is your best opinion as to what the weather actually was at the scene of the accident at that time?

Mr. PETERSON. As a brief summary of conditions in that area at that time, and taking full account of the pilot reports available, there were undoubtedly scattered thundershowers around, but they were widely enough scattered so that they were quite easily circumnavigable. The tops of those thunderstorms probably extended above the flight level.

Mr. DOLLIVER. What flight level?

Mr. PETERSON. Twenty-one thousand feet. Normally, at that season of the year, fully developed thunderstorms build to between thirty and forty thousand feet.

Mr. WILLIAMS. Did you say that your reports indicated that the clouds were scattered or broken?

Mr. PETERSON. Scattered at 21,000 feet. Clouds extending up to and above that elevation would easily have been circumnavigable.

Mr. HARRIS. They could certainly have been circumnavigable?

Mr. PETERSON. Yes, sir.

Mr. WILLIAMS. That is all.

Mr. DOLLIVER. Do you have any way of knowing whether this information which you have outlined so fully weatherwise, on June 30, was in the possession of the pilots or the navigators of these planes?

Mr. PETERSON. I have no way of knowing for certain. All of the information that we prepared for flight operations in the way of

weather forecasts and reports are available to the airlines for their full use.

Mr. DOLLIVER. This information was available to the officers of the two ships?

Mr. PETERSON. Yes, sir; that is true.

Mr. DOLLIVER. Before they left the ground or while en route?

Mr. PETERSON. The forecasts which I read in the statement were available to the flights before they left the ground. These forecasts would have been available to the respective airline companies.

Mr. DOLLIVER. Do you have any way of knowing or hazarding a guess as to whether this collison took place in a cloud formation or in the clear?

Mr. PETERSON. No, sir; I would have no basis for making an estimate on that. I would see no reason for them to be in clouds in that area.

Mr. DOLLIVER. Why do you say that?

Mr. PETERSON. Because of the normal character of thunderstorm or thunderhead cloud forms. They were easily visible and easily circumnavigable according to the reports we have available.

Mr. DOLLIVER. In other words, there was plenty of clear space around which or in which they could have navigated their ships without getting into a cloud formation at all.

Mr. PETERSON. Yes, sir.

Mr. DOLLIVER. That is all, Mr. Chairman; thank you.

Mr. ROGERS. Mr. Peterson, you referred to scenic flights over the canyon along about that time. Do you have any information as to what altitude those flights were conducted?

Mr. PETERSON. Yes, sir. The statement of the Hudgin brothers indicated an altitude of about 9,000 feet.

Mr. WILLIAMS. Those were light planes, were they not?

Mr. PETERSON. Yes, sir.

Mr. ROGERS. Now, they were flying at 9,000 feet above sea level, over the canyon that morning, carrying people on scenic tours of the canyon; is that correct?

Mr. PETERSON. Yes, sir.

Mr. ROGERS. About what time, or what was the time element of the scenic flights?

Mr. PETERSON. I believe they did not list the actual times of the scenic flights, but that scenic flights were made between 8:30 a. m. until 1 p. m.

Mr. ROGERS. That would indicate, would it not, that if this collison did take place because of clouds, it would almost have had to take place at 9,000 feet or above; that is, 9,000 feet above sea level?

Mr. PETERSON. The scenic flights were made under the cloud base.

Mr. ROGERS. Which was at 9,000 feet above sea level.

Mr. PETERSON. Yes, sir; the two airline aircraft were above the clouds.

Mr. ROGERS. They were supposed to be above the clouds but we do not know where they were when they hit.

Mr. PETERSON. I am assuming that they were at or near 20,000 or 21,000 feet, according to their plan.

Mr. ROGERS. The point I am making is that you cannot assume that, because you do not know where they were. However, if they were

below 9,000 feet above sea level they were in the absolute clear, that is the point I am making; is that correct, according to your records?

Mr. PETERSON. According to this pilot report, yes, sir.

Mr. ROGERS. That is all, Mr. Chairman.

Mr. SPRINGER. I am sorry I missed the first part of this, and I may cover something again, but I want to ask a preliminary question.

At what altitude did this crash take place; do you know?

Mr. PETERSON. I am afraid I am not qualified to answer that question.

Mr. SPRINGER. The last permission that was given by the control tower in Los Angeles to either one of these planes prescribed what height?

Mr. PETERSON. I am sorry, I am not qualified to answer that either, sir.

Mr. SPRINGER. I have just this one question, then: Insofar as it has come to your attention as a weatherman, is there any relation of the weather to this accident?

Mr. PETERSON. I see no direct relationship, if you have in mind flight in the clouds at the time of the accident.

Mr. SPRINGER. That is all.

Mr. WILLIAMS. Mr. Chairman, I have one more question, and I think the answer to it is pretty obvious, but for the sake of the record I want to ask it anyway.

At the altitude at which these planes were assumed to be flying, twenty or twenty-one thousand feet, was the visibility unlimited except for the cloud formations? That is, the area in the clear, was visibility unlimited?

Mr. PETERSON. Yes, sir.

Mr. WILLIAMS. At that altitude it would be, but I wanted to get that in the record.

Mr. HARRIS. In other words, to make it clear as Mr. Rogers pointed out a moment ago, assuming the planes were at 21,000 feet, they would have been above what is referred to as scattered clouds.

Mr. PETERSON. They would have been above the lower overcast. Let me show another chart here, sir, and I think it will help.

Mr. HARRIS. All right.

Mr. PETERSON. They would have been above this [pointing] lower overcast, and above these [pointing] clouds, but there were scattered thunderheads or thundershowers extending vertically through this approximate altitude of 20,000 feet, which they would not have topped but could easily go around. The lower cloudiness was reported as overcast at that time. They were above that.

Mr. HARRIS. Then assuming for the purposes of this question, that they were below 9,000 feet, then their visibility would have been unlimited or they would have had no difficulty in seeing.

Mr. PETERSON. The visibility, as reported by the scenic people, was excellent underneath the clouds, over the Grand Canyon area.

Mr. HARRIS. Now, if the sightseers reported by these two gentlemen, the Hudgin boys, if they could see up through the clouds and see the sky, then by the same deduction, if you had been up above you could have seen through the clouds down to the ground.

Mr. PETERSON. Yes; if an aircraft were on the same line of sight with the hole or thin spot in the clouds.

Mr. HARRIS. While you have that chart there, suppose you give me this information: Which point would be referred to as the heavy cumulus?

Mr. PETERSON. Heavy cumulus would be this [pointing]. It is called swelling cumulus in common terms.

Mr. HARRIS. That is the big cloud.

Mr. PETERSON. Yes, sir.

Mr. HARRIS. What would be referred to as the cumulonimbus?

Mr. PETERSON. This would be the rain cloud, with this [pointing to cirrus streaming from the cloud top] to depict a fully developed thunderstorm, and the cloud extending up thirty to forty thousand feet.

Mr. HARRIS. The pilot of the American Airline flight from San Francisco to Dallas, I believe it was, told us that he went around this cloud that he saw over the Grand Canyon. If I remember correctly, he said that there were three of those clouds, cumulonimbus clouds, extending up about, he estimated, 25,000 feet. Does that pretty well jibe with your records?

Mr. PETERSON. In respect to that, I do not believe his statement was clear as to the location of the cumulonimbus clouds. He said farther to the northeast. We have not tried to tie down the exact location on any one of these charts.

Mr. HARRIS. I believe he did say that it was right over the canyon.

Mr. PETERSON. He said there was one over the Grand Canyon; yes.

Mr. HARRIS. So far as his description is concerned, at that point it does agree with your records.

Mr. PETERSON. Yes, sir. It does. We should also keep in mind the reports of the climatological stations in the Grand Canyon area. None of them reported rain at that time. One reported rain later.

Mr. WILLIAMS. What is the altitude of the terrain?

Mr. PETERSON. The south rim, around 7,000 feet, to make it a round number. The north rim of the canyon is 8,200 feet to about 9,000 feet.

Mr. WILLIAMS. Then these planes were flying around 10,000 or 11,000 feet above the terrain itself?

Mr. PETERSON. That is right.

Mr. ROGERS. And the scenic flights were only about 2,000 or a little less above the rim of the canyon.

Mr. PETERSON. That is right.

Mr. ROGERS. Thank you, sir.

Mr. HARRIS. Thank you very much, Mr. Peterson.

If there are no further questions, I want to say that we appreciate this information.

Mr. Oscar Bakke.

STATEMENT OF OSCAR BAKKE, DEPUTY DIRECTOR, BUREAU OF SAFETY REGULATION OF THE CIVIL AERONAUTICS BOARD

Mr. HARRIS. You are Deputy Director of the Bureau of Safety Regulation of the Civil Aeronautics Board?

Mr. BAKKE. Yes, sir.

Mr. HARRIS. And I believe you have a statement that you are prepared to present.

Mr. BAKKE. Yes, sir; I do.

Mr. HARRIS. You may proceed.

Mr. BAKKE. Mr. Chairman, Federal regulation of civil aviation derives its authority fundamentally from the Civil Aeronautics Act of 1938, as amended. This act superseded the Air Commerce Act of 1926. Whereas the Air Commerce Act of 1926 had vested in the Secretary of Commerce the responsibility for the regulation of civil aviation, the Civil Aeronautics Act of 1938 placed this duty upon an independent Civil Aeronautics Authority. In 1940, as a result of Reorganization Plans 3 and 4, the Administrator of Civil Aeronautics, together with the executive functions with which he was charged under the act, was removed from the organizational structure of the Civil Aeronautics Authority and placed within the framework of the Department of Commerce. The five-man Civil Aeronautics Authority was redesignated the Civil Aeronautics Board. At present, therefore, the Civil Aeronautics Board carries out its quasi legislative functions as an agency independent of the executive.

The Bureau of Safety Regulation is that organization within the Board which carries out the staff responsibilities for the development of the Civil Air regulations. The Bureau of safety regulation is an organization consisting of 18 technicians and 13 secretarial and clerical personnel. The technical specialists of the Bureau represent a cross-section of the skills of the aviation industry so as to insure adequate appreciation of the problems with which the Board's safety regulations must deal.

Mr. HARRIS. If you will permit the interruption, did they not have an independent safety board originally?

Mr. BAKKE. The Independent Air Safety Board which was established under title 7 of the Civil Aeronautics Act.

Mr. HARRIS. I am referring to the act of 1938.

Mr. BAKKE. Yes, of the act of 1938; it was responsibile for the investigation of accidents. That Board was not charged with any of the quasi legislative functions of the Civil Aeronautics Authority.

Mr. HARRIS. But it was an independent Air Safety Board.

Mr. BAKKE. Yes, sir; it was an Air Safety Board.

Mr. HARRIS. Charged wtih investigating air accidents.

Mr. BAKKE. That is correct, sir.

Mr. HARRIS. And making its report, then, to the Civil Aeronautics Authority.

Mr. BAKKE. That is correct, sir.

Mr. HARRIS. And not to the Civil Aeronautics Administration.

Mr. BAKKE. That is correct, sir. The Air Safety Board was authorized to make recommendations. Those recommendations could, of course, be directed——

Mr. HARRIS. To whom?

Mr. BAKKE. To the Civil Aeronautics Authority. However, the Administrator of Civil Aeronautics Authority was separately authorized to perform certain functions. He was the minister of the air traffic control function, of the Navigations Aids System of the United States. The Air Safety Board could develop recommendations which were applicable to the Administrator.

Mr. HARRIS. What happened to the Air Safety Board?

Mr. BAKKE. I did not mention that, sir. The Air Safety Board was abolished under Reorganization Plans 3 and 4, and the accident investigation function was placed directly under the Civil Aeronautics

Board. That function is today carried out by the Bureau of Safety Investigation of the Civil Aeronautics Board.

Mr. HARRIS. I wanted to get that in the record for our information, because this all happened about the time that I came here and about the time I went to this committee.

I recall that there was a great deal of criticism of this action that was taken at that time. A lot of people felt that it was not in the best interests of civil aviation and I did want the record to show just what happened. Now, did the Bureau of Safety within the Civil Aeronautics Board take the place or assume the functions of the old Air Safety Board?

Mr. BAKKE. It did, sir. At one time an organization then known as the Safety Bureau performed both the staff regulatory function as well as the investigatory function of the Board. However, that organization was changed approximately 7 years ago and 2 separate bodies now execute those 2 functions—the Bureau of Safety regulations with respect to the rules, and the Bureau of Safety Investigation with respect to accident investigation.

Mr. HARRIS. Very well, you may proceed.

Mr. BAKKE. The Civil Air Regulations represent a compilation of 41 parts, each of which treats a particular field of aviation. Parts Nos. 1 through 16 deal with the airworthiness of aircraft and components. Part 18 deals with maintenance. Parts 20 through 35 deal with airmen certification. Parts 40 through 47 deal with air carrier, commercial and general operation rules. Part 49 deals with the transportation of dangerous articles. Parts 50 through 54 deal with agency certification and rating. Part 60 contains the air traffic rules, part 62 the aircraft accident notification and reporting requirements, and part 190 the authorization of navigation of foreign civil aircraft in the United States.

Aviation represents one of the most dynamic expressions of human ingenuity. No informed person today doubts that the entire aviation industry has undergone and will in the foreseeable future continue to undergo considerable change. It should be recognized, therefore, that any body of regulations seeking to control such an industry must either be sufficiently flexible to allow essential changes to occur or must themselves be subject to change to accommodate new conditions. Consequently, the responsibility for the development of the Civil Air Regulations involves a continual reanalysis of those regulations in order to insure that the promotional and safety objectives of the act are realized to the extent practicable.

The Board itself is especially sensitive to the continuing demands flowing from the phenomenal development of aviation. However, we recognize not only the obligation of persons subject to the Civil Air Regulations to inform the Board of deficiencies in the regulations but as a very practical matter must acknowledge the almost limitless sources of information available in such persons, particularly in the aviation industry. It is not unnatural, therefore, that many recommendations should be received from interested persons. The Civil Aeronautics Administration with its substantial field staff, which is responsible for the administration and enforcement of the Board's regulations, is a most valuable source of recommendations. The Board's own accident investigation staff also discloses many conditions which require rulemaking. For instance, last week the Board met with

representatives of organizations having an interest in the air traffic rules for the purpose of discussing their views concerning amendments required to minimize the hazard of collision in flight. The following organizations were represented: Air Line Pilots Association, Air Transport Association, Aircraft Owners & Pilots Association, National Business Aircraft Association, Air Traffic Control Association, Air Line Dispatchers Association, Department of Defense, and Civil Aeronautics Administration.

Whatever the source of recommendations—and they are many—the procedure which leads to the amendment of the Civil Air Regulations is one which is governed in large part by the Administrative Procedure Act. Typically, the Bureau of Safety Regulation will develop a notice of proposed rulemaking which defines particular issues with which the Board is confronted and propounds policies and principles which appear to be applicable, on the basis of which a specific amendment is proposed. This notice is normally published in the Federal Register and, additionally, circulated to interested persons as a draft release. In such a notice, interested persons are invited to submit comments or recommendations concerning the proposed rule in order to assist the Board in determining whether the public interest would be served by its adoption. If the comment received so warrants, the Bureau recommends adoption of the amendment as proposed or as modified in the light of the comment received.

The foregoing procedure is followed in every case unless an emergency is found to exist which requires the Board to act immediately. However, in recent years the Board has found it advisable in many instances to introduce still another formal process through which coordination of the Civil Air Regulations with interested persons is accomplished.

Where a particular rulemaking project involves a highly complex and controversial subject, or when it contains a large number of separate provisions such as might be involved in the revision of an entire part, the Board has circulated proposals in a discussion-draft form. In addition to the written comment normally solicited in such a notice, the Board might also notify interested persons that this discussion draft is to be the basis for a technical conference conducted by the Bureau of Safety Regulation for the purpose of further exploration of facts, views, and arguments pertinent to the issues at hand. In this event, a formal and more final notice is circulated after the conference is held. In at least one field—namely, aircraft airworthiness—such a procedure is regularly employed. Meetings are conducted annually and are known as the annual airworthiness review. One such schedule of meetings is currently in process here in Washington.

I am informed that there are approximately 150 technicians from all over the country and the world, and approximately 25 representatives of foreign nations and foreign manufacturers who are gathered at the Interdepartmental Auditorium right now through one of these procedures, which I have here described.

Regardless of the procedure which is followed by the Board's staff in the development of proposed amendments to Civil Air Regulations, before any proposal is adopted, interested persons may request opportunity to present oral argument directly before the Board itself.

Recognizing the unique position of the Administrator of Civil Aeronautics in the administration and enforcement of the Civil Air Regula-

tions, the Board has developed a separate and additional procedure for the coordination of proposed amendments of the Civil Air Regulations with the Civil Aeronautics Administration.

This interagency coordination is intended to insure the avoidance of unnecessary administrative burdens resulting from the regulations, and also to insure that the rules will be reasonably enforcible. This internal staff machinery is also used as a means whereby the Civil Aeronautics Administration presents proposals for the amendment of the rules to the Board.

On occasions, problems are encountered which require a more highly localized knowledge than the Board's staff is normally able to command. For instance, although the determination of the minimum ceiling and visibility for instrument approaches to the airport at Elko, Nev., is in some respects a part of the rulemaking function, the prescription of such minimums requires the intimate knowledge of the airport and the surrounding terrain.

This is also true with respect to instrument approach procedures and the prescription of en route minimums for particular route segments.

Because of its more ministerial nature, the Board has delegated this activity to the Administrator of Civil Aeronautics.

Similarly, there are areas of the Civil Air Regulations in which the matters being regulated are subject to considerable change, and require the continued scrutiny of a substantial field organization in order to provide for the required flexibility. We have found this to be true with respect to many elements of aircraft instruments and equipment, and such procedures as are involved in aircraft maintenance, which are the subject of frequent negotiation between CAA agents and aircraft operators.

Accordingly, the regulations frequently require such equipment and procedures to be approved by the Administrator. This process of approval, although also somewhat administrative in character, fequently requires the promulgation by the Administrator of criteria which are regulatory in character.

There is still another area within which the Board has found it useful to delegate rulemaking functions to the Administrator. On occasions, the Board has certificated certain experimental operations such as the local area operations and the scheduled helicopter air carrier operations. In both instances, the novelty of the operations made it inadvisable for the Board to prescribe detailed requirements in the Civil Air Regulations. Since in both cases the Administrator has had agents assigned directly to these operations, it was possible for him to arrange for the negotiation of appropriate standards on an ad hoc basis as experience was accumulated.

The Board followed these experimental operations through their initial stages and gradually developed a code which could be suitable for adoption as a part of the permanent body of rules. This delegation is, therefore, interim in character and is applicable praticularly to experimental operations or new developments.

I might add in passing that the act, in section 601, paragraph (c) of the act, makes it quite clear that the Board nevertheless retains the power of review of the Administrator's actions in his use of the delegated rulemaking authority.

The Civil Aeronautics Act charges the Board with the duty of—

> * * * prescribing and revising from time to time * * * air traffic rules governing the flight of, and for the navigation, protection, and identification of, aircraft, including rules as to safe altitudes of flight and rules for the prevention of collisions between aircraft, and between aircraft and land or water vehicles.

Mr. WILLIAMS. May I ask a question here?

You say the Civil Aeronautics Act charges the Board with certain duties. I presume that is the Civil Aeronautics Board.

In the next sentence you refer to the Administrator. Are you referring to the CAA Administrator?

Mr. BAKKE. Yes, sir.

The paragraph which I am just about to present concerns the Civil Aeronautics Administrator. The one that I just finished presenting dealt with the Civil Aeronautics Board.

Mr. WILLIAMS. Thank you.

Mr. BAKKE. The Administrator is authorized to designate civil airways and, within the limits of available appropriations made by Congress, to provide, among other things, necessary facilities and personnel for the regulation and protection of air traffic. In exercising control over air traffic, the Administrator is required to take account of air traffic rules promulgated by the Board.

The act further provides that the Administrator shall give full consideration to the requirements of national defense.

In carrying out these functions, the Board and the Administrator are directed to consider—

> * * * in the public interest, and in accordance with the public convenience and necessity—
>
> (*e*) The regulation of air commerce in such manner as to best promote its development and safety; and
>
> (*f*) The encouragement and development of civil aeronautics.

It should be noted also that the declaration of policy in title I of the Civil Aeronautics Act provides:

> There is hereby recognized and declared to exist in behalf of any citizen of the United States a public right of freedom of transit in air commerce through the navigable air space of the United States.

In the light of the foregoing it is clear that the Board's obligations with respect to the continued development of air-traffic rules is to insure adequate separation of traffic while avoiding any unnecessary restrictions to the free and expeditious flow of traffic. It is true that in many instances safe separation and freedom from restriction are mutually conflicting objectives. In such cases the compromise has been sought which most nearly serves the public interest.

The CAA has principal responsibility for the operation of air-traffic-control services, while the Board has principal responsibility for the promulgation of air-traffic rules.

There is obviously a close relationship between the air-traffic rules and the control of the air traffic inasmuch as part 60 of the Civil Air Regulations forms the basis upon which air-traffic control procedures are developed. It is equally obvious that the air-traffic rules cannot be fully developed without taking into account the capacity of the CAA to carry out its air-traffic-control function. Furthermore, there is a substantial volume of VFR traffic subject to the visual-flight rules of part 60 but not subject to any direct control by the CAA, which

constitutes a potential collision hazard for aircraft operating under VFR and IFR alike and which relies solely upon the vigilance of pilots to insure continued separation.

There must be effective collaboration, therefore, between the Board's technical staff and the technical staff of the Administrator. The Board has had very favorable working relations with the CAA in the development of compatible air-traffic rules and air-traffic-control functions.

The air-traffic rules are contained in part 60 of the Civil Air Regulations and are applicable to all aircraft operators, civil and military. These rules are based upon the principle that pilots shall provide their own separation when visibility conditions are such that they can see and avoid other aircraft. When visibility deteriorates to the extent that this can no longer be done, other means for providing separation must be devised.

Air traffic control is established for the purpose of maintaining traffic separation in control areas under conditions in which it is impossible for pilots to perform such functions themselves. In determining the responsibilities of individual pilots for traffic separation, the concept of "see and be seen" must be applied. This concept requires, in effect, that under conditions of visibility in which pilots can see other aircraft sufficiently to provide adequate traffic separation, the pilot must assume complete responsibility for avoidance of collision in flight.

The rules of part 60, therefor, prescribe requirements both for aircraft operations during good weather conditions, when pilots may rely upon seeing each other to insure separation, and for aircraft operations during poor weather conditions when pilots cannot insure their own separation.

Throughout the history of aviation the need for vigilance to avoid other traffic has been so intimately woven into pilot training and indoctrination as to require no detailed regulatory treatment. Even if there were no specific regulatory provision governing, the need for vigilance to observe and avoid other air traffic is so generally accepted and has been publicized so widely that no airman could fairly be said to be unaware of the obligation which rests upon every pilot in this respect.

The self-evident nature of the requirement for traffic vigilance is reflected in section 60.12 of part 60 of the Civil Air Regulations and the note appended thereto. This section provides that—

> no persons shall operate an aircraft in a careless or reckless manner so as to endanger the life or property of others.

As an illustration of careless and reckless operation, a note is added specifically identifying—

> lack of vigilance by the pilot to observe and avoid other air traffic.

The Board is of the view that this language of part 60 leave no doubt whatever of the regulatory compulsion for the exercise of vigilance by the pilot in avoiding other traffic during visual flight rules conditions.

It is estimated that the existing air traffic control machinery of the CAA possesses a traffic-handling capacity equal to but one-fifth of all aircraft movements. Since the beginning of air-traffic control it has

been impossible to accommodate all aircraft operations within a practicable system of positive control, and it appears that this situation will continue to exist for the foreseeable future.

So long as the traffic-control system cannot accommodate all aircraft operations regardless of weather conditions, it is necessary that the air-traffic rules draw a line of demarcation between the conditions in which pilots may be expected to see and avoid other traffic and the conditions in which separation must be provided by an air traffic control agency. Air-traffic control cannot, therefore, deny the use of control areas to flights being conducted under conditions which are adequate for pilots, at all times, to see and avoid other aircraft.

In applying the principle of "see and be seen" in the air-traffic rules, part 60 up to the present time has dealt principally with the meteorological conditions which affect a pilot's ability to see other aircraft. These conditions are normally expressed as visibility and distance from clouds. Accordingly, the air-traffic rules prevent a pilot from flying close to clouds or from flying in certain conditions of restricted visibility unless he is able to comply with certain additional requirements applicable to instrument flight operations.

Air-traffic control, under the Board's rules, may impose additional specific limitations upon IFR operations with respect to the courses and altitudes to be flown.

Other parts of the civil air regulations contain rules which, though not classified as air traffic rules, have a distinct bearing on the problem of collision avoidance. The air carrier operation rules are contained in parts 40, 41, and 42 of the civil air regulations. These parts contain the requirements applicable to the routes and airports on which operations are to be conducted. They also include requirements for instruments and equipment necessary to navigate satisfactorily, to communicate for operational and air traffic control purposes, and to insure aircraft conspicuity at night.

In addition, the complement of the crew is specified for various operations and aircraft types. In this respect it should be pointed out that certain flight crew members have been required aboard aircraft to insure, among other things, avoidance of excessive preoccupation of the pilots inside the cockpit. The operating limitations applicable to operations other than air carriers are contained in part 43. Although many of the same requirements pertinent to collision avoidance are contained in part 43, its scope is generally more limited.

Several of the airworthiness parts of the civil air regulations contain provisions for aircraft and equipment certification or approval which may be considered relevant to collision avoidance. These rules include such matters as communications and navigation equipment, exterior lighting equipment, and cockpit visibility.

AIR TRAFFIC CONTROL SERVICES

The air traffic control services are provided by the Administrator under the powers and duties prescribed in title III of the act. This service is operated also pursuant to the pertinent provisions of part 60. For instance, with respect to airport traffic control, section 60.18 (b) requires that:

> If air-traffic control is in operation at the airport, contact shall be maintained with such control, either visually or by radio, to receive any air traffic control instructions which may be issued.

Section 60.19 specifies that:

> No person shall operate an aircraft contrary to air traffic control instructions in areas where air-traffic control is exercised.

With respect to air route traffic control, section 60.43 requires that:

> Prior to takeoff from a point within a control zone, or prior to entering a control area or control zone, an air-traffic clearance shall be obtained from air-traffic control.

Section 60.21 requires that except in an emergency, or unless the clearance is amended or canceled "the pilot in command of the aircraft shall not deviate from the provisions" of an air-traffic clearance.

In many instances discretion is left with the Administrator with respect to the manner in which the objectives of part 60 are to be realized. In many such circumstances the Administrator has supplemented the civil air regulations with Civil Aeronautics Manual provisions which are published in the Code of Federal Regulations, together with the appropriate civil air regulations. Other pertinent provisions may be contained in air-carrier operations specifications issued in accordance with the appropriate air-carrier operating regulations. Still other material is published in the Flight Information Manual. The basic procedures and techniques of air-traffic control are contained in the ANC—the Air Force-Navy-Civil—Procedures for the Control of Air Traffic.

For many years it has become increasingly apparent that conditions other than weather conditions are being encountered which directly affect aircraft separation and of which account must be taken in the continued development of the air-traffic rules. For instance, it appears that under certain circumstances the rate of closure of very high-speed aircraft is such that the total time in which an aircraft may be visible to a pilot of another aircraft is so short that pilots cannot be expected to insure separation between aircraft irrespective of the weather conditions in which they are flying.

It is also apparent that the density of air traffic, particularly in the vicinity of certain major air terminals, has approached or is approaching serious proportions. Obviously, the greater the number of aircraft movements within a given airspace the more difficult it is for a pilot to separate himself adequately from other aircraft regardless of the vigilance exercised. Since these are the two principal problems which have arisen in recent years which affect the air-traffic rules, and with respect to which much concern has been expressed, we believe it would be useful for the committee to consider the manner in which the Board is pursuing solutions consistent with the policy enunciated in the act.

The solution to the problem of increasing speeds of aircraft which has appeared most obvious has been to extend positive control to all airspace within which high-speed aircraft operate.

As early as 1940, when speeds of 200 miles per hour were considered high, recommendations were made to the Board to subject all aircraft operations on the civil airways to instrument flight rules or otherwise to insure positive separation at all times. This recommendation has been repeated on numerous occasions since that date.

At each time the Board has been called upon to consider such recommendations it was concluded that the air-traffic control system maintained by the CAA did not have the capacity to accommodate more

than a small percentage of the total number of aircraft using controlled airspace. No responsible segment of the aviation industry has been prepared at any time since 1940, or is now prepared, to accept the obviously great restriction upon the flow of air traffic which such a requirement would effect.

The existing air-traffic control system is hard put today to accommodate the traffic desiring to use airspace under IFR conditions; the accommodation of all current VFR operations within such a system is clearly impossible at the present time.

It is axiomatic that the highest aircraft speeds are encountered at high altitudes. It has appeared for some time, therefore, that the traffic-separation problem inherent in high speed should be attacked, initially at least, at high altitudes.

On several occasions during the past 8 years plans have been considered for the initiation of an area system of traffic control at high altitudes in which positive control would be provided for all aircraft. However, the conclusion was inevitably reached that adequate facilities and techniques for the control of all traffic in all airspace at high altitudes did not exist.

The fact that greater difficulty has not been experienced at high altitudes can be charged to the random nature of aircraft movement and to the relatively small numbers of aircraft which have been using these flight altitudes. However, the increasing number of turbine-powered aircraft and the increased use of more accurate navigational aids, which tend to concentrate aircraft on particular courses, have again compelled the consideration of such a program. The CAA has, accordingly, developed a 5-year plan—which, I understand, will later be described possibly more accurately as the 3-year plan—which envisages, among other things, the initiation of an area-control system above 24,000 feet.

Although it is not contemplated that all aircraft operating in this airspace will be subject to instrument flight rules in the immediate future, it is clear that this program will enable the Administrator to determine whether control techniques are sufficiently practicable to accommodate all traffic. Similarly, experience with an area-control system will enable a determination to be made as to whether such a system can be extended successfully to cover traffic at lower altitudes.

The Board is following the implementation of the program closely in order to remain alert to the regulatory implications involved. Furthermore, this program will be monitored by the navigation and air traffic control panel of the Air Coordinating Committee.

There are, of course, many problems of technical detail which are being encountered in the separation of aircraft at high altitudes. There is serious question, for instance, whether the quadrantal altitude rules provide adequate vertical separation in view of the magnitude of typical errors of aircraft altimetry at high altitudes.

There is also some question as to whether pilot technique should be expected to remain within the same limits of precision at high altitudes as nearer sea level even if there were no material differences in altimeter system errors. These are currently being examined, however, and the Board anticipates developing appropriate amendments to the civil air regulations in due course.

An increase in the vertical separation provisions of part 60 for VFR high-altitude operations has been proposed by the Board in draft release 56–14, the comments concerning which are now being analyzed.

The problem of aircraft density could conceivably be solved by the extension of positive control to include all aircraft operations. Although such a solution has been recommended in the past, the Board has consistently taken the view that the principal effect of such a requirement would be to restrict the movement of the large majority of aircraft. Accordingly, this solution would be, in effect, to solve the traffic density problem by eliminating the traffic.

Other recommendations have been found to possess considerably greater merit. Some of these envisage a requirement for radio communications for air traffic control purposes on the part of all aircraft operating in controlled airspace or in high-density areas. Other proposals envisage a modified form of traffic control such as an informatory control which would not impose the absolute restrictions resulting from our existing forms of positive control. Still other proposals seek a limitation upon the range of speeds within which aircraft shall fly in high-density areas thereby reducing the critical effects of high-traffic density.

In order to determine the extent to which additional limitations might usefully be imposed, the Board promulgated Special Civil Air Regulation No. SR–408 in November 1954, which authorized the Administrator to designate a high-density air traffic zone in the Washington area and to establish such additional restrictions upon the movement of air traffic within that zone as appear necessary for the safe separation of traffic. This authorization was effective until July 31, 1956.

It was the Board's intention that this delegation to the Administrator constitute an experiment on the basis of which the Board might later determine whether procedures and restrictions which have been employed do in fact contribute to safer and more efficient control of air traffic.

The results of this trial have led to the development of proposed amendments to the civil air regulations which would place a speed limit of 180 miles per hour upon aircraft operating within such a zone, require two-way radio communication for operations to and from the airport, and prohibit VFR clearances when the visibility is less than 1 mile.

However, rather than continue such limitations on a temporary basis in the Washington area, the Board has proposed in Draft Release 56–22 that they be applied either in all control zones are in any high-density area designated by the Administrator. Moreover, a proposal to increase control zone visibility and distance-from-cloud minimums has been circulated as Draft Release No. 56–7.

As was noted earlier, the sources of recommendations for the amendment of the civil air regulations are many. Some are developed within the Board's staff; others are received from various segments of the aviation industry.

Because of the all-inclusive scope of part 60, doubtless all segments of the industry and the military have at one time or another submitted recommendations for amendment. A substantial number of recommendations originate in the CAA.

The detailed staff investigation of recommendations for the amendment of the Civil Air Regulations is the responsibility of the Board's Bureau of Safety Regulation. An initial investigation is accomplished by the appropriate division of the Bureau in order to determine whether the amendment proposed appears to be in the public interest and, if so, the priority with which it should be pursued. The Bureau thereafter undertakes such field investigations or discussions with other interested persons as may be required in the particular circumstance. Close coordination with the appropriate CAA staff is normally maintained throughout this process.

At the completion of the staff investigation a report is compiled, and, if appropriate, a notice of proposed rulemaking prepared. This notice is subject to further coordination between the CAA and the Bureau of Safety Regulation in order to determine whether any unique problems of administration or enforcement are involved and to insure the continued compatibility of the air traffic rules and the air traffic control system.

Notices of proposed rulemaking are published and circulated to interested persons for periods of time between 30 and 90 days, depending upon the scope of the proposal in question. During this period all interested persons, CAA included, are invited to submit comment concerning the advisability of the proposed amendment. When the complexity of the matter or the controversy it has engendered warrants, the Board's staff may arrange for a formal meeting in Washington to discuss the merits of the proposal at greater length. In a few instances the resolution of differences between interested persons has proven sufficiently difficult to justify the formal hearing of oral argument by the Board.

The Board has recently adopted Special Civil Air Regulation SR–416 concerning the voluntary reporting of near midair collisions. The collection and analysis of the near-miss reports is being undertaken by the Board's Bureau of Safety Investigation.

We believe that the reporting procedures which have been developed will gain the confidence of pilots sufficiently to permit regular and complete reports of incidents which will assist in our continuing review of current practices and regulations. We expect that such a program will serve to isolate further any defects which require our attention. In addition, the Board also has access to reports and recommendations which are made by the staff of the CAA concerning problems encountered within the air traffic control services which indicate the need for regulatory action.

The air traffic system of the United States represents a totality of aeronautical operation within which no single agency has exclusive jurisdiction and in which no one group can claim exclusive possession of essential information.

It is true that the Civil Aeronautics Act has established the legislative jurisdiction of the Board and the administrative jurisdiction of the Civil Aeronautics Administration. However, agencies such as the Air Force, Navy, Coast Guard, and CAA are all engaged in large-scale research, development, and operation of navigational aids. Private interests such as the air carriers, in some instances through the Air Transport Association, and individual equipment manufacturers are also engaged in developmental projects and/or in the operation of navigational facilities. The Department of Defense, the air carriers

and organizations representing private pilots all possess a wealth of operational knowledge which is essential to the development of policies, procedures, and facilities pertinent to air traffic control. That, of course, also includes the Airline Pilots Association.

In view of the great flux in the state of the art, a coordination of technical knowledge, including current operational experience as well as future plans, among all interested persons has proved to be especially important.

The navigation aids and Air Traffic Control Panel of the Air Coordinating Committee is the principal forum for the development of operational requirements for air traffic control facilities and systems. The Radio Technical Commission for Aeronautics is the principal body concerned with the coordination of detailed engineering requirements and systems specifications for air navigational and other facilities pertinent to air traffic control. The Board, through its technical staff, has membership on both of these groups, and has found them an especially useful means of keeping abreast of the art. Similarly, the Bureau has been in a position to advise all of the foregoing bodies of the regulatory policies of the Board which are pertinent in this field.

In my testimony of July 7, 1956, before this committee I made certain remarks concerning section 40.32 of part 40 of the civil air regulations which deals with IFR routes outside of control areas. In focusing upon the machinery which was devised for the approval of air traffic routes and, in particular, upon the manner in which traffic density was to be considered, I neglected to distinguish between the effect of this requirement on high-altitude operations as compared with other operations. Mr. G. F. White, of the General Counsel's Office of the CAA, later called the committee's attention to this fact and asked that the record reflect the precise applicability of this section.

Mr. White was entirely correct in his remarks to the effect that section 40.32 was not applicable to high-altitude operations. The language of this section reads as follows:

> IFR routes outside of control areas shall be approved if the air carrier shows that the navigational and communications facilities are adequate for the operations proposed, unless the Administrator finds that because of traffic density an adequate level of safety cannot be insured in a particular area: *Provided*, That for high altitude operations IFR routes need not be approved.

I believe the language of this section to be self-explanatory.

That completes my statement, Mr. Chairman.

Mr. HARRIS. Thank you very much, Mr. Bakke, for a very clear discussion of the problem.

I must confess there are many questions in my mind, and I am sure they will be cleared up as the hearing progresses.

Mr. Williams?

Mr. WILLIAMS. Mr. Bakke, like the chairman, I want to congratulate you for giving us a very clear dissertation on the subject of the responsibilities of the Board and the CAA.

Getting down to specific cases—and this dates back to the Grand Canyon collision—as I recall the testimony before this committee in our earlier hearings, some of the CAA stations along the way knew that these two planes were in the same area flying converging courses and that they had the same ETA for the same point over the Painted Desert.

As I recall it, one of the planes was apprised of the fact that the other plane was in the same area and was at approximately the same altitude.

The committee went into the responsibility of the CAA operators at the communications stations with respect to notifying both of these planes that there were other planes in the area. And, as I recall, it was shown that there was no responsibility, no legal responsibility resting on the shoulders of the CAA controllers to so notify these two planes.

I am wondering if the Civil Aeronautics Board or the Civil Aeronautics Administration has taken action since that accident which would place some responsibility in the hands of these communications officers or weather officers, as the case may be, to notify planes that that are other planes in the same area at approximately the same altitude when they have knowledge of this condition?

Do I make myself clear?

Mr. BAKKE. Yes, sir.

This particular question has been considered by the Board, and has been discussed between the Board and the CAA. The service to which you refer, that is, the passing on of essential traffic information from personnel who are engaged in one capacity or another in the air-traffic-control service, is a gratuitous service on the part of the CAA.

Mr. HARRIS. Is a what?

Mr. BAKKE. Is a gratuitous service on the part of the CAA. It is not one which is mandatory upon any of the persons participating in this service.

I would suggest that, so far as a complete delineation of the policy of the Administrator in this respect and the instructions to his personnel are concerned, they might better be described by the spokesmen for the CAA. But I will mention the extent to which the Board has given consideration to such a service.

Mr. WILLIAMS. I realize that it is a gratuitous service under the present regulations, but I am wondering if you recognize a moral responsibility to notify these planes of the presence of other aircraft at the same altitude?

Mr. BAKKE. Well, sir, you ask whether there is a moral responsibility.

The morality of any such situation must be measured in the light of the knowledge which the individual possesses with respect to the practicability or the usefulness of such a service.

And the comment that I was about to make had to do with that question. How useful, how productive is it for communicators generally to provide this type of traffic information to pilots?

Now it is clear that there are some instances in which it is useful. But I think it is likewise clear that there are many, many instances—and, by far, the great majority of instances—in which the providing of this type of information is not useful to the pilot, serves to divert the attention of the pilot, unduly occupies essential communications services of the Administrator and otherwise may be considered not to be in the best interests of civil aviation generally.

For that reason it has been our judgment, it has been the opinion certainly of the Board's staff in this matter, by the way, I should add, has not until today formally been considered by the Board as a part

of its rulemaking procedure, and we are still discussing this matter with the CAA. But to date our view has been that the pros and cons with respect to this procedure require that there be left with the Administrator and ultimately with the Administrator's people sufficient discretion so that he may give this kind of information when it is apparent that it will do good, and withhold it when it is apparent that it would not be useful to pass it on.

For that reason, realizing that it must be discretionary with the Administrator, the Board has not found it necessary or advisable to promulgate any regulations which would have the effect of requiring that this type of information at all times be made available to pilots.

That may not be a complete answer to your question, sir, but it is as much of an answer as I can give at the moment.

With respect to the further refinement of such a service as I said before, we are in consultation with the CAA and we hope to be able to perhaps develop some additional principles or policies that might usefully be applied in this respect.

Mr. WILLIAMS. Mr. Bakke, on the basis of the information that the committee has, I think most of us assume that these two planes collided at approximately 21,000 feet. I believe it was a Salt Lake City station, as I recall, or one of the stations along the way, who had received reports from both aircraft reporting in at 21,000 feet on converging courses to intersect a few miles beyond the Painted Desert at approximately 11:31.

One of the airplanes was notified that the other plane was flying in the same general area at 21,000 feet.

Is it reasonable to assume that there might have been a possibility that this collision could have been avoided had both planes been notified to be on the alert for the other plane in the area at the same altitude at the same time?

Mr. BAKKE. I think that is entirely possible, sir. On the other hand, I think the committee would probably agree that it is so speculative that it would hardly be the type of possibility on the basis of which we could, for instance, develop a requirement for a regulation.

But, in direct answer to your question, I think it is quite possible that such information might have averted this collision.

Mr. WILLIAMS. It would not necessarily be speculative if you had these conditions prevailing again where these planes were flying converging courses at the same altitude and at approximately the same speed, would it?

Mr. BAKKE. Well, sir, if I may be permitted a slight departure—perhaps just to generalize the subject for a moment—it has been my experience—and there is nothing unique in my experience in this respect, but this happens to be one of the fundamental issues which is involved in many discussions that have been had on the——

Mr. WILLIAMS. In asking these questions I do not mean to imply any criticism at all of any of the actions of anyone involved.

Mr. BAKKE. No, sir; by all means.

Mr. WILLIAMS. I realize that there was no legal responsibility on the shoulders of the CAA controllers to so notify these planes. However, this committee—and, I am quite sure, the CAB and the CAA—are all looking for solutions to the problems that we have. I ask

these questions merely to get your views in order that we might be enlightened to some extent.

Mr. BAKKE. What I started to say, sir, was that it has been my experience and that of many other folks who fly or who observe other pilots in flight regularly that when information is given concerning traffic all one has to do in riding the jump seat when a report is rendered that there is an aircraft at 9 o'clock is observe that both pairs of eyes in the cockpit immediately proceed to the 9 o'clock direction to locate this one particular airplane.

The question has been raised many times: What about the other airplane that is at 1 o'clock who is not known to air traffic control who also constitutes a collision hazard, the presence of which should be known to these pilots?

In other words, this is a way of saying that at no time in flight under VFR conditions, where the principle of see and be seen applies, at no time during that flight must there be any circumstances in which there is not a surveillance of the flight path ahead of the aircraft within which a traffic hazard may reasonably be expected.

So we take the view that there are instances in which this type of information may actually cause preoccupation or diversion.

Now, since that possibility also exists, it also must be considered. The possibility of an occurrence such as that must be weighed against the possibility that the pilot may not have observed the particular airplane to which his attention was being drawn. And it is because of the fact that there are these kinds of pros and cons that we have felt that the proper thing to do is to leave it as a matter which should be handled under the discretion of the air traffic controllers.

Mr. WILLIAMS. One more question.

I know that the CAB and the CAA have conducted continuous studies of this problem, particularly since this Grand Canyon accident occurred. What changes, if any, have been made in air traffic rules or in the promulgation of safety regulations since this accident to prevent a possible recurrence of the same type of accident?

Mr. BAKKE. The direct answer to that question is, so far as air traffic rules are concerned, none.

In explanation of that answer I should say, however, as I am sure the committee appreciates, the causative factors which were at work the day of this accident have not been very easy to identify. And, as a matter of fact, there is still, among those who have not been directly involved in the accident investigation—I am not able to speak for the investigation people themselves—but, as one of many who stands at least in part outside of the investigation process and awaits its outcome, I can say that there still is a great deal of speculation and controversy as to what particular causative factors require our attention in order to prevent exactly that type of accident from occurring again. And I must say that the visibility isn't entirely good in that direction. I mean it is not entirely clear to us as to what the cause of that accident might have been. And we are still awaiting the final pronouncement of the Board with respect to the cause of the accident.

It has clearly, however, pointed to so many other elements of the air traffic picture that require our attention. It has had many corollary effects, many of which I detailed in my statement.

Since the first of the year we have developed in the neighborhood of half a dozen proposed amendments to the air traffic regulations, at least some of which would affect similar flights—not exactly the same type of flight because the high altitude quadrantal rule, for instance, would take effect above 29,000 feet. This was one of the proposals that we have under consideration.

So I would say, sir, that as a result of the accident there have been many areas of air traffic rules which have been subject to very intense scrutiny, but that there has been no specific proposal developed which would be aimed precisely at the factors involved in this accident.

Mr. WILLIAMS. Is it contemplated that any changes will be made in the foreseeable future?

Mr. BAKKE. Yes; very definitely, sir.

As I explained also in the statement, we had a meeting——

Mr. WILLIAMS. Is it your feeling or the Board's feeling, if you can speak for the Board, that the current need for revision of civil air traffic rules can be met by amending your present rules and regulations, or will it be necessary to overhaul the entire system and start over from the beginning?

Mr. BAKKE. I see no real necessity for the latter, sir. I think in my statement I explained the manner in which we are able to branch out from our present concepts and embrace the new principles that have been found to be needed by reason of the new conditions which we have encountered—high altitude, high speed, and high density operations.

I don't think there is any need for a complete revolution in thinking. I think this is the type of thing which we can develop in an orderly manner.

Mr. WILLIAMS. That is in contemplation of the anticipated subsonic and supersonic speeds that we can expect over the next 8 to 10 years?

Mr. BAKKE. Yes, sir; very definitely.

Mr. WILLIAMS. That is all.

Mr. HARRIS. Mr. Dolliver, do you want to proceed now or wait until after lunch?

Mr. DOLLIVER. I will yield to the chairman's wishes in that respect.

Mr. HARRIS. I think, in view of the circumstances then, if you can come back at 2 o'clock, Mr. Bakke, we will recess now until that time.

Mr. BAKKE. All right, sir.

Mr. HARRIS. I have a good many questions myself, I might say, that I want to ask.

The committee will recess until 2 o'clock.

(Whereupon, at 12:05 p. m., the committee was recessed, to be reconvened at 2 p. m., this same day.)

AFTERNOON SESSION

The committee reconvened at 2 p. m., upon the expiration of the recess.

Mr. HARRIS. The committee will come to order.

I believe when the committee recessed members were interrogating Mr. Bakke after he had completed his statement.

We are glad to observe our colleague from Maine, Mr. Hale, is back with us this afternoon.

I wonder if you have any questions, Mr. Hale, that you would like to ask at this time.

Mr. HALE. No, sir.

Mr. HARRIS. Mr. Dolliver, sir?

Mr. DOLLIVER. Yes, Mr. Chairman, I do have some questions.

STATEMENT OF OSCAR BAKKE, DEPUTY DIRECTOR, BUREAU OF SAFETY REGULATIONS, CIVIL AERONAUTICS BOARD—Resumed

Mr. DOLLIVER. As I understand it, you are the Deputy Director of the Bureau of Safety Regulations, which is a Division in the Civil Aeronautics Board; is that right?

Mr. BAKKE. That is correct, sir.

Mr. DOLLIVER. Do you have some others working with you in that Bureau, or what is your status in that respect?

Mr. BAKKE. The Bureau consists of the Director's Office, with which I am associated, and three divisions:

An Air Carrier Division, an Airworthiness Division, and a General Rules Division.

Within the Director's Office and the 3 divisions there are 18 technicians who are skilled in various aspects of aviation matters.

Mr. DOLLIVER. So there is a total of 18 personnel in this Bureau of Safety Regulations?

Mr. BAKKE. These, sir, are technicians.

In addition to these are 13 clerical and secretarial persons; 31, to be exact; yes, sir.

Mr. DOLLIVER. You are the Deputy Director, I note. Who is the Director?

Mr. BAKKE. Mr. John Chamberlain.

Mr. DOLLIVER. You work directly under him. Do you have any specialty of your own, or are you in charge of all of the various divisions to which you refer?

Mr. BAKKE. Functionally within the Bureau my responsibility is that of a work coordinator and promoter, you might say. It is that of promoting the work and of coordinating the rulemaking activities of the Bureau.

I have direct supervision over what we know as our project system. That is a system whereby the work is parceled out among the three divisions and in which a record is maintained of the progress on each, in which priorities are established and, generally, assurance is given the Board that progress is being made on the technical studies which are a part of the Bureau's work.

Mr. DOLLIVER. Do I understand that ultimately the rules promulgated by your Bureau have the approval, either specifically or tacitly, of the Civil Aeronautics Board?

Mr. BAKKE. Sir, the Bureau has no legislative authority of its own. It performs a staff function for the Board. It performs the technical studies. It, with the assistance of the General Counsel's Office, drafts regulations, coordinates them among interested persons, and eventually presents them to the Board with a recommendation for adoption, or whatever other recommendation may be appropriate.

The 5-man Board is charged with the final responsibilities of either adopting or rejecting the proposed regulations.

Mr. DOLLIVER. The procedure by which you develop and promulgate, and finally adopted by the Civil Aeronautics Board, these regulations are somewhat complicated, I gather from your statement.

On page 5, for example, you refer to the fact that you have to deal with the Administrator of Civil Aeronautics.

Mr. BAKKE. Yes, sir.

Mr. DOLLIVER. Does he act in an advisory capacity to you; does he have a veto power over your recommendations; or what is the situation as between you and Civil Aeronautics Administrator?

Mr. BAKKE. In the first instance, sir, the Administrator of Civil Aeronautics, so far as rulemaking in which he himself does not participate directly—that is, where he does not actually perform rulemaking under delegated authority by the Board—the Administrator is regarded as an interested person before the Board, similar to other interested persons, such as an air carrier, or the purchaser of an airplane, or a pilot.

He is another interested person whose views are solicited by the Board. In that respect he is an adviser to the Board.

Now, after the final processes of coordination are accomplished, however, the Board then recognizes the unique aspect which the Administrator enjoys, namely, that he is the Administrator of the Board's regulations. He enforces the Board's regulations, and so on top of the normal coordination procedures, we have arranged an internal interagency procedure whereby we also coordinate the regulations to insure that we create no administrative hardship on the CAA by insuring that the rules are reasonably enforceable and that they do not impose burdens by reason of their timing, for instance, or the obligations which they might impose on Civil Aeronautics Administration personnel which might be unduly severe.

Mr. DOLLIVER. The truth is, then, that the Civil Aeronautics Administrator does have a considerable influence, if not actually a veto power?

Mr. BAKKE. No, he has no veto power whatever. I think it is perfectly fair and proper to say that the Administrator has a considerable influence on the framing of the regulations; yes, sir.

Mr. DOLLIVER. You refer to another matter in your statement just made that there are some areas where the Civil Aeronautics Administrator has the rulemaking power himself.

Mr. BAKKE. Very definitely, sir.

Mr. DOLLIVER. Can you delineate the difference between the rulemaking power which he possesses and the rulemaking power which the Civil Aeronautics Board possesses?

Mr. BAKKE. In the first instance, sir, we must recognize the source of the authority for rulemaking. In the case of rulemaking as it is accomplished by the Board, it is done directly under the statutory provision; that is, the Civil Aeronautics Act of 1938, as amended.

This act, section 601 (c), to be exact, enables the Board to delegate this rulemaking authority to the Administrator in particular instances in which the Board finds that the composition of the Civil Aeronautics Administration enables the Administrator in particular cases to do a more complete, or more effective job, of rulemaking.

In our prepared statement, we outlined three areas within which the Board currently delegates rulemaking authority to the Admin-

istrator. These are: An area within which a highly localized knowledge is required, where it takes a considerable regional staff with people who are familiar with particular airports and environments about those airports in order properly to determine such things as airport minimums.

This highly localized type of knowledge is more easily provided by the very large and well dispersed staff of the CAA.

Also, the CAA has agents assigned directly to air carriers, to manufacturing establishments. Their wide dispersal makes it possible for people to negotiate directly with operators, or manufacturers, or other interested persons on matters in which direct negotiations are essential, so the second area within which we delgeate is in that area in which we have found by experience that there is a large turnover, a very rapid change in such things as procedures, instruments and equipment, and things of that sort, and where we would be entering into a very, very detailed field of regulations.

In this particular area we have found it useful to delegate to the Administrator by allowing him to approve, and, in fact, requiring the Administrator to approve, certain procedures, industries, equipment, and so on.

The process of approval, we point out in our statement, is in some respects administrative in character.

However, it also possesses much of the nature of rulemaking, since the Administrator very frequently, although perhaps not in every instance, presents detailed criteria which are used in exercising this approval authority.

A third area in which the Board delegates to the Administrator is one in which we are dealing with very novel situations, the very novelty of which require a continual negotiation between a representative of the Government and the person being regulated.

One such area is in the experimental helicopter operations which have been authorized by the Board to be conducted in three metropolitan areas: New York, Chicago, and Washington.

When these three scheduled helicopter operations were begun the Board had no fund of experience or knowledge behind it on the basis of which to regulate a new type of air transportation, the rotocraft. Because of this the Board called upon the Administrator, to negotiate directly with the carriers pretty much on an ad hoc basis, as we gained experience, as new situations arose, and as new equipment was introduced. On that basis we felt that reasonable supervision and regulation could be assured until such time as the Board found it timely to adopt a part of the Civil Air Regulations which would have reasonable stability.

Now, we are about to do that. We have circulated two notices of proposed rulemaking with respect to scheduled helicopter operations and are about now, after these years of experimentation, to adopt a part 46 of the Civil Air Regulations. The Administrator then will be relieved of most of this delegated, interim authority.

Mr. DOLLIVER. Do I understand that in these three categories you have mentioned, the Administrator has the final word? He does not come back to you or the Board for approval or disapproval of any of the rules that he makes in these three areas?

Mr. BAKKE. In no instance has the Board required that the Administrator come back for the Board's approval.

In some instances the Board has expressly required that the Administrator notify the Board. In other instances the Board has by regulation prescribed a process whereby the person subject to these decisions or regulations of the Administrator may appeal to the Board.

In still other instances, the regulations are silent on the question of the extent to which the Board shall review the actions of the Administrator, but the act is clear—section 601 makes it very clear—that the Board may by regulation reserve for itself to the extent the particular requirement warrants the right to review.

Mr. DOLLIVER. It is true, then, that there is a division of authority between the Civil Aeronautics Administrator and the Board, as far as rulemaking is concerned, the Administrator's authority having been delegated under the statute by the Board to him?

Mr. BAKKE. Very correct, sir.

Mr. DOLLIVER. On page 10, I would refer you to the two full sentences at the top of the page:

> So long as the traffic-control system cannot accommodate all aircraft operations regardless of weather conditions, it is necessary that the air-traffic rules draw a line of demarcation between the conditions in which pilots may be expected to see and avoid other traffic and the conditions in which separation must be provided by an air-traffic control agency. Air-traffic control cannot, therefore, deny the use of control areas to flights being conducted under conditions which are adequate for pilots, at all times, to see and avoid other aircraft.

Those are rather categorical statements.

Assuming that there was sufficient personnel to give the necessary instructions, air to ground, or ground to air, or interplane communications, and adequate appropriations were made, could you not set up such a system?

Mr. BAKKE. Sir, if you would add but one other condition, and that is that the exercise of such a system would not be unduly burdensome to the persons regulated, my answer would be there would be no reason in the world why we couldn't write regulations requiring such an effect.

Where we say "traffic control cannot, therefore, deny the use," the air-traffic control is meant in the agency sense.

Under our existing regulation the air-traffic-control agency may not deny the user of control airways by flights who are able to conduct themselves under the see-and-be-seen concept.

Mr. DOLLIVER. We have seen an enormous increase since World War II in civilian air traffic and judging from all the signs we are likely to see an enormous increase in the next 10 years, even greater percentagewise and in amount than we have seen in the past decade.

It would seem possible, at least, or even probable that, in view of that increasing traffic, especially of the subsonic or even supersonic speed, in order to control it you would have to go far beyond what you say here and that strict traffic control under all conditions would have to be imposed.

You suggest that in the third condition, if it would not be an undue burden upon the carriers.

What do you mean by that?

Mr. BAKKE. Not by carriers, sir. I said operators.

Mr. DOLLIVER. Operators; all right. I take the revision.

Mr. BAKKE. The Congress has, I think, given a very compelling instruction to the Board in title I of the act, a portion of which I read

in my statement, when it charged the Board that in carrying out its rulemaking functions, it shall recognize—and this appears on page 7 of our statement, and declare—

to exist in behalf of any citizen of the United States a public right of freedom of transit in air commerce through the navigable airspace of the United States.

We point out the fact that this is the other side of the scale.

The Board is clearly charged with the responsibility for regulating air-traffic safety and is also charged with the responsibility of seeing that it does not do so arbitrarily or capriciously, that it does not improperly or unduly limit, as the Congress has said, the freedom of transit in air commerce. So we try to balance the two at all times.

Mr. DOLLIVER. It resolves itself into a question of where you are going to find a golden mean between those two concepts; is that not true?

Mr. BAKKE. Exactly, sir.

Mr. DOLLIVER. I refer you to another sentence on page 10 which is the last sentence in the last paragraph:

Air-traffic control, under the Board's rules, may impose additional specific limitations upon IFR operations with respect to the courses and altitudes to be flown.

Would you give an example of such additional specific limitations which might be imposed?

Mr. BAKKE. Yes, sir. A pilot who is desirous of flying between New York and Washington will file a flight plan. That flight plan will show the altitude at which he desires to fly.

Mr. DOLLIVER. Are you talking about a commercial plane now, or private plane?

Mr. BAKKE. Any plane, sir. Any plane has access to the air-traffic control agency.

The filing of the flight plan is in effect a request for authorization to conduct instrument flight within controlled airspace.

In making that request, or in filing the flight plan, the pilot would normally ask for a specific altitude and a specific route.

If the air-traffic control agency is able to accommodate the pilot, it may approve his operation and may authorize that operation at the altitude requested and on the route requested.

As likely as not, however, on this particular route, Washington to New York, air-traffic control may come back and say, "We are unable to approve 13,000 feet. Will you accept 15,000 feet?" There is a limitation. He may go only if he is able to accept 15,000 feet.

He may have asked for an airway or a combination of airways on which the traffic is already saturated, and he may be told, "We are unable to approve such-and-such a departure procedure or such-and-such a route between the two points. But we can route you over an alternate route."

There, again, is another limitation. He may go, providing that he goes by the particular route which the air traffic control agency has stipulated. He may be asked to hold. He may get as far as relay intersection where air-traffic control may intercept, may communicate with him, and instruct him to hold until further advised.

This is a limitation presumably because of traffic congestion ahead. This is the type of limitation which the air-traffic control agency may

impose in addition to the specific prescriptions of the safety air regulations.

Mr. DOLLIVER. That refers to instrument flight operations?

Mr. BAKKE. Yes, sir.

Mr. DOLLIVER. What about visual flight rules? Do you have the same power, or does the operational agency have the same right under the visual rules to impose these specific limitations?

Mr. BAKKE. He has not, sir.

Mr. DOLLIVER. None?

Mr. BAKKE. May I qualify that?

The example that I gave with respect to the imposition of limitations on IFR flight had to do with the functions of the air route traffic control, which is the agency that imposes limitations typically in en route operations.

There is, however, another function, which is still a traffic control function, but specifically known as airport traffic control.

Under our regulations airplanes intending to land or take off at airports at which airport traffic control is exercised must comply with the clearances and instructions given by the airport traffic controller irrespective of whether it is IFR or VFR, but this is limited to the control zone which surrounds the airport in question.

With the exception of airport traffic control there is no control exercised for VFR operation such as that which I described for IFR.

Mr. DOLLIVER. Who determines which of the airports do have this control, either for landing or taking off? Who makes that determination?

Mr. BAKKE. In the technical sense, sir, the Administrator of Civil Aeronautics makes that determination. It is, as the act makes plain, however, subject to the appropriations made available by the Congress, but in the technical sense the Administrator makes that determination, sir.

Mr. DOLLIVER. The Board has nothing to do with that?

Mr. BAKKE. No, sir; we do not.

Mr. DOLLIVER. Again I refer you to page 14—this perhaps is a little repetitious—and the last full sentence in the first paragraph there:

> The existing air traffic control system is hard put today to accommodate the traffic desiring to use airspace under IFR conditions; the accommodation of all current VFR operations within such a system is clearly impossible at the present time.

Would you elaborate that sentence a bit and say why this situation exists, or if there is a remedy, what it is?

Mr. BAKKE. Sir, I would first like to make very clear that this particular sentence was not intended to be in any respect critical of the air traffic control system.

It was stated as a fact which the Board must recognize in its air traffic rulemaking. We know that under instrument conditions, particularly in the northeast area of the United States, there are typically delays in the handling of traffic.

I, myself, have sat at the end of runways for sometimes long over an hour waiting for an airways clearance, because under the present separation criteria, present techniques, present machinery for doing the job, and the present density of air traffic in these high-density areas, there simply isn't enough airspace to go around under IFR control. This observation merely recognizes that. The Board therefore asks

itself, in the light of this fact, whether a large percentage, perhaps a large majority, of our current operations would be grounded by a requirement which imposed a positive separation upon all traffic, VFR or IFR.

The effect of that grounding is not warranted by reason of the traffic hazards which are inherent in VFR operations.

This is the issue with which the Board must come to grips. The Board has to date determined that even under our present system, with a few exceptions which are subject to rulemaking and which I described before, such as high-density limitations, the concept of see and be seen is still workable. It is still usable.

We see very clear limitations upon that concept. We take no issue with the folks who say that high-speed, high-altitude airplanes traveling on reciprocal courses at the same altitude may not see and avoid each other, and we believe we are on the right track so far as remedy of that situation is concerned.

So far as low-altitude operations where large numbers of aircraft are to be found, the Board has said that today's economy, aviation today, cannot tolerate the price of complete positive control of all traffic.

Mr. DOLLIVER. You might have dropped a phrase there that interested me. You say you are on the right track with respect to separation of high-speed, high-altitude traffic. What is that right track? What are you talking about?

Mr. BAKKE. Sir, this situation is much like two gears that are meshed in a machine. The Board has, as we explained in the statement, the rulemaking authority.

The Administrator, however, operates the Federal airways machinery and performs the functions of air-traffic control.

We have followed with considerable interest the development of the 5-year plan which, although I don't know that the title has changed, has for all practical purposes now become a 3-year plan, which has been developed by the CAA.

This plan envisages that special attention shall be given to high-altitude operations and the Administrator is now attempting to develop facilities and procedures which will better enable him to extend, to more broadly extend, positive control at high altitudes, because, as we pointed out in the statement, the highest of speeds is axiomatically in high-altitude operations.

Now, for the low-altitude operations, especially in a high-density area, we are of the view that since we cannot impose positive control on all aircraft there, while it may be possible at high altitudes, it might be necessary for us to impose speed limitations.

Just don't let airplanes fly more than 180 miles an hour in a high-density area.

Such a rule has been proposed and is now being considered by the Board.

With respect to high-altitude operations again we are working with the CAA to determine the extent to which they are able to extend positive control and we are prepared to propose such adjustments in the regulations as will be possible as a result of the increased capacity of the system at high altitudes.

Mr. DOLLIVER. Would you think that with respect to the high density around some of the major airports one of the answers might be the diversion of that high density traffic to some other or some new

airports, or an increase in the number of runways of the existing airports? Would that be a help?

Mr. BAKKE. Yes. Any of those devices, sir, would serve to decrease traffic density, and anything that decreases traffic density decreases the probability of collision.

Mr. DOLLIVER. Despite the unprecedented accident that happened last June over the Grand Canyon, your greatest hazard is in the vicinity of high-density traffic around the major airports; is that not true?

Mr. BAKKE. That is our judgment, sir, and that is where our principal planning activity has been directed.

Mr. DOLLIVER. On page 16 there is one phrase I do not understand, which I would like to have you explain to me. It is language beyond my ken. It is in the fourth line from the bottom—"quadrantal altitude rules"—what does that mean?

Mr. BAKKE. Sir, we have a requirement in part 60 of the Civil Air Regulations which in effect divides the compass into four quadrants and says that any aircraft flying northeast outside of controlled airspace above 3,000 feet when under certain visibility conditions, must maintain an odd-thousand foot flight level. That might be 5,000, 7,000, 9,000 feet.

If he is flying in a southeasterly direction, between 90° and 179°, he must fly at an odd-thousand-foot flight level, plus 500 feet, which would be 5,500, 7,500 feet, and so on.

Flying southwest it would be an even-thousand-foot level and northwest an even thousand and plus 500 feet.

These are known as the quadrantal altitude rules.

Mr. DOLLIVER. That explains it. Thank you.

One question, with reference to what you say on page 19, and I think it is implicit in your entire statement:

> The air-traffic system of the United States represents a totality of aeronautical operation within which no single agency has exclusive jurisdiction and in which no one group can claim exclusive possession of essential information.

Do you mean by that that there is no place that this congressional committee can go to get complete information on this subject?

Mr. BAKKE. I don't mean to say, sir, that it is not possible that an agency may complete all of—"all" of course, is a very inclusive word, sir, but let's say all essential information.

However, if there is such an agency it would be necessary for that agency to go to each of the agencies that we have listed here and get it. That type of information is not inherent within any particular agency.

This represents one of the greatest coordination tasks in my judgment that faces the Federal Government. There are so many people who have such a great interest in this particular problem that there is no way in my judgment that we can avoid the kind of machinery that is necessary to bring all interested parties together to insure that we have the benefit of all of their views and that we have advantage of all of the information that each possesse, because each possesses a tremendous amount of information.

That was the principal sense of this last paragraph. There has to be machinery provided to do this great coordination task.

Mr. DOLLIVER. Is not that what the Congress tried to do in setting up the Air Coordinating Committee?

Mr. BAKKE. Yes, sir. I should answer it this way: that the Air Coordinating Committee was intended to satisfy such a need; yes, sir.

Mr. DOLLIVER. However, I take it from your statement—maybe I am putting words in your mouth now—that you do not think it has accomplished that purpose.

Mr. BAKKE. No, sir; I didn't intend that that be the case, sir.

As a matter of fact, I went on and explained that Board participation in the ACC has been very useful, we think, not only to the Board, but also to the ACC.

Mr. DOLLIVER. Of course, you point out something that is well known to this committee; that there is a good deal of difference of opinion as between civil aviation and military aviation ,and sometimes those differences are extremely difficult to coordinate because the demands imposed are quite essential and oftentimes conflicting.

Does the Air Coordinating Committee include any military members?

Mr. BAKKE. Yes, sir.

Mr. DOLLIVER. As well as civilian members?

Mr. BAKKE. Yes, sir.

Mr. DOLLIVER. So it is designed to bridge that difference; is it not?

Mr. BAKKE. Very definitely, sir.

Mr. DOLLIVER. Would you care to give to the committee, if you are able, your understanding of the authority of the Air Coordinating Committee?

Preface that by giving us the composition of AAC, and then your views of it.

Mr. BAKKE. The Air Coordinating Committee itself is composed of the various agency representatives, high level representatives—I would say at the under secretary level—of agencies having an interest in aviation.

The Air Coordinating Committee is composed of at least three—the information I may give, by the way, with respect to the structure of the Air Coordinating Committee could better be given by others and I shall do the best I am able——

Mr. DOLLIVER. Yes.

Mr. BAKKE. At least the three major divisions, the economic division, legal division, and the technical division.

My own familiarity with the ACC is principally within the area of the technical division. The technical division itself is broken down into many subcommittees, such as the subcommittee on flight operations, the subcommittee on communications, or airport and ground aids. These are technical subcommittees.

The ACC spends most of its time and devotes most of the paperwork it produces to matters which affect United States dealings with the International Civil Aviation Organization. There are operations which in the ACC are not international in character, that is true, but the general observation I have made is that most of the product of the ACC has to do with the development of positions for ICAO meetings, the evaluation of ICAO documents, that sort of thing.

The ACC is a body within which representatives of many interested agencies and certain non-Government operations, such as the Air Transport Association or the Aircraft Industry Association, the Airline Pilots' Association, or Aircraft Owners and Operators Association, Pilots' Association, get together to assess the impact on the

United States of various international standards or procedures that are developed through ICAO.

The ACC, in this respect, acts as adviser to the Department of State who transmits to ICAO these consolidated or coordinated United States positions.

This function is a very valuable function. It enables the Board to advise other member agencies of regulatory policy, of principles that are inherent in the regulations, in order the more completely and more effectively to speak for the United States before ICAO.

It also enables the Board to benefit from the collective experience of the folks who are on the ACC.

With respect to rulmaking, occasionally rulemaking functions of the Board are involved in actions taken by the ACC, such as, for instance, those which might involve international standards, which the Board might be committed to evaluate with a view toward either writing comparable standards in our own regulations, or notifying ICAO of a difference between our regulations and the international standards.

In such instances, when the Board's rulemaking powers are involved, the ACC clearly acts as an advisory agency. It has no final authority. Only the Board has legislative authority or quasi-legislative authority in the field of civil aviation.

Mr. DOLLIVER. Do I take it from what you have said that the Air Coordinating Committee has had little to do with coordinating except in the international field? Is that correct?

Mr. BAKKE. No, sir; but this is the principal area within which it has operated.

Mr. DOLLIVER. Do you know of any instance where the Air Coordinating Committee has undertaken to and accomplished a coordination between the civilian and military flight difficulties?

Mr. BAKKE. Oh, very definitely, sir.

Mr. DOLLIVER. Has that happened often?

Mr. BAKKE. Yes, sir. Yes, sir; it happens often enough so that we can, I think, look with some credit on the operation of ACC in this field.

Mr. DOLLIVER. Who represents the Civil Aeronautics Board on the ACC?

Mr. BAKKE. The Civil Aeronautics Board member is Senator Gurney, 1 of the 5-man board.

Mr. DOLLIVER. Thank you very much. That is all.

Mr. HARRIS. Mr. Mack?

Mr. MACK. Mr. Bakke, what is your definition of positive control?

Mr. BAKKE. Sir, it is that control which is exercised by a ground agency which relieves the pilot of an aircraft of any responsibility with respect to the separation of traffic other than the carrying out of instructions or the compliance with clearances issued by that agency.

Mr. MACK. Then obviously all of your IFR clearances are not positive control?

Mr. BAKKE. No, sir; they are not.

Mr. MACK. What percentage of them would be?

Mr. BAKKE. I am sorry that I am unable to give you any precise percentage.

Mr. MACK. The reason I ask the question is because you have mentioned in your statement that presently they are unable to accommodate all the VFR traffic under IFR flight plans. That is on page 14.

I was wondering approximately what traffic could be controlled or could be afforded positive control.

Mr. BAKKE. Sir, perhaps I can answer the question this way: That of all of the aircraft operations in the United States approximately 20 percent are handled under IFR clearances.

Mr. MACK. This is all the air traffic?

Mr. BAKKE. That is correct.

Mr. MACK. Not merely scheduled airlines?

Mr. BAKKE. That is correct, sir, about 20 percent. Of the total air-carrier planes something less than 50 percent on a day like today, for instance, or on a day in which it is not necessary to move under an IFR clearance, something less than 50 percent of air-carrier aircraft will choose to use IFR clearances.

Of the IFR clearances—of that group of flights which is something less than 50 percent of the total—and this was what I understood your question to be directed at—of those, I don't know what percentage, will be operating under 1,000 on top clearances.

For that group of aircraft positive control is not being provided.

There is just one other condition that I must apply, and that is for this entire group of aircraft, whether IFR or VFR—since the assumption I made was that it was a day in which it was not necessary to fly IFR even though there are those who have been assigned a specific altitude and a specific route—so long as the visibility conditions are such that, under our part 60, pilots may expect to encounter other aircraft, notwithstanding their clearance, they would have no positive separation from other aircraft.

Mr. MACK. So you say you could not have positive control as long as you have VFR flight rules in effect?

Mr. BAKKE. Precisely, sir.

Mr. MACK. It is also true that in addition to those who fly on top you will have a certain number of IFR flight plans which will be off airways and in that event they will not have positive control as well?

Mr. BAKKE. Exactly right, sir.

Mr. MACK. Then you will have an additional number of IFR plans who will be departing or arriving VFR; so in that portion of the flight you do not have positive control, either?

Mr. BAKKE. Exactly right, sir.

Mr. MACK. So, therefore, it would get down to a very, very small percentage, even in instrument weather, that you would have positive control over?

Mr. BAKKE. Yes, sir. Positive control is provided by the Government only for those flights in designated controlled airspace which are conducted under conditions in which the regulations by definition state pilots will not be able to see and avoid other aircraft.

Mr. MACK. So today you have a very, very small percentage, of all traffic, including military, that actually flies under positive control?

Mr. BAKKE. Under positive control; yes, sir.

Mr. MACK. I just wanted to clear that point up.

If I could, I would like to return to the statement that you made this morning concerning gratuitous service. Do you recall that?

Mr. BAKKE. Yes, sir.

Mr. MACK. I think you used it only as an example, the accident that occurred out in the Grand Canyon. I believe that Mr. Williams asked

you—I don't remember the exact words—if you did not feel obligated to recommend some regulation to require the controllers to give out certain information; and, if I did not misunderstand your answer, I think that you said "No."

Mr. BAKKE. That is correct, sir.

I made one qualification, and that, I suppose, is necessary with respec to every requirement we have in the booff: that, with the situation changing as it is in aviation, my answer might be different tomorrow. The answer that I gave, "No," was predicated, of course, on our existing code. This is the picture as we see it today, and I also went on to explain that we are in the process of negotiating with the Administrator and we are discussing this very question with him; but, until another answer appears to have greater merit, our answer must be that we do not see that such a requirement is justified.

Mr. MACK. In other words, you have the obligation to make a recommendation in such instances, but in this particular instance you do not feel that such recommendation should be made; is that correct?

Mr. BAKKE. That is correct, sir.

Mr. MACK. I was somewhat surprised to hear that it was a gratuitous service, because I personally feel that the controller certainly would be morally obligated to pass that information on.

I believe, in my opinion, that the Civil Aeronautics Administration itself is obligated to give such service to air carriers or airplanes.

Mr. BAKKE. Sir, I shouldn't wish to comment on the morality, or lack of it, with respect to a CAA procedure.

I might add, with respect to something which is fairly well defined in air traffic control procedures, you might find discussion with one of the CAA representatives more fruitful.

Mr. MACK. I am aware of that.

Mr. BAKKE. With respect to our requirements for it, however, I would say that we would not consider that there would be a moral obligation, at least not the kind of obligation that we would also recognize as an obligation to proceed with rulemaking, to make such a service mandatory.

Mr. MACK. If I were flying at such an altitude and encountering such traffic, I would personally feel that the controller would be morally obligated to give me that information, and especially under present circumstances when it is rather difficult for the pilots to keep their eyes on their instruments and observe all of the other traffic in the particular area, and I certainly feel it would be a moral obligation on the individual to give that information.

In your reply, you mentioned that if it was called to his attention that there was a plane at 9 o'clock, the pilot and the copilot would immediately look in the direction of 9 o'clock, and I cannot see anything wrong with that, myself.

Would you explain to me just what is wrong with both pilots looking for an airplane at the same time?

Mr. BAKKE. No, sir; I don't think there is anything wrong with that at all, sir. I think we would have to understand the situation something like this: that everyone, of course, is familiar with the back-seat driver, the one who wants to call attention to every automobile, every obstacle, every what-have-you.

I don't think there is any doubt, sir, that under circumstances where a pilot is very busy looking for airplanes—and this is true, for instance,

on departures out of the Washington area—when you see an airplane to your right, one ahead of you, one who is below you looking like he is climbing, one above you looking like he is descending, and one to the left, it is somewhat annoying out of this total mass of possible collision traffic, to have someone divert your attention, especially with respect to only one.

My field is not air traffic control. I have said this before, but I will say it again: That I don't believe my views should be considered conclusive in this respect, but certainly we believe that there is merit in the view that for such a procedure to be sufficiently useful, to be standardized, to be mandatory, throughout the air traffic control system, it must be a great deal more capable of providing a complete service than it is now, and now there is just enough question in our mind as to whether it is anywhere nearly a complete service and, furthermore, whether it is not in some instances diversive or tending toward preoccupation.

Mr. MACK. Any regulation can be so worded as to carry out the intent of Congress, or the Civil Aeronautics Board, or the Civil Aeronautics Administration, by wording your regulation so that the controller was morally obligated to render such service, and you do not have to say that they have to tell a pilot when the plane is within 500 feet on a course of 180°, or be that specific, but at least we could place a responsibility on them to offer an additional service.

You talked about the back-seat drivers and I think that if you had some back-seat drivers you could have avoided a couple accidents. I do happen to know that the military just recently has gotten this program under way that when they are out on routine flights and as they are approaching airports they have what we call observers who sit in the seats behind the pilots, look out, observe of other traffic, and inform the pilots. I do not know of any accidents that have been caused from those back-seat drivers up to this time.

As far as calling attention to the pilot of traffic in the area, that is the way that they handle their control departures here, by calling the attention of the pilots to a plane at 9 o'clock, as you mentioned, and I have not noticed that any of the planes have spun in in the meantime when they have been observing the traffic in the area.

Therefore, it seems to me that such service would contribute to the safety of aviation, by having this additional service, and if the people are aware of the traffic that information should be passed on to the pilots.

I want to also ask another question.

You mentioned that you thought that we should perhaps amend some of the regulations, or laws, which affect aviation, but you did not see any reason for complete reorganization. You do not have to comment on this. I am going to ask you if you do not feel that it might be advisable to have a major reorganization in some areas, such as again setting up an independent Civil Aeronautics Authority with the full responsibility in it rather than having them answer to some secretary of the executive?

Mr. BAKKE. I think my answer would be, sir, that so far as my technical cognizance is concerned, so far as the types of problems which I normally encounter in my work, I have not been able to see any need for that, or any other such major reorganization.

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Mr. MACK. Thank you very kindly for your comments, sir.

Mr. Chairman, I have no further questions, but I do believe that this committee should give considerable thought to reorganization in the Civil Aeronautics Administration with the thought of perhaps setting up a new independent agency, because this agency deals with safety and it is a very complicated field.

We have progressed in the field to where we have terrific loads of passengers traveling by commercial airlines and I believe that we should investigate the possibility of eliminating the political effect that might retard our progress in this field.

Mr. WILLIAMS. Will the gentleman yield for one question?

Mr. MACK. I yield.

Mr. WILLIAMS. Mr. Bakke, along the lines that you were questioned by Mr. Mack; in your opinion, would the controller's action in alerting the aircraft of the presence of other aircraft at the same altitude add to the safety factor, or would it detract from the safety factor?

I hope I make myself clear.

Mr. BAKKE. I believe so, sir. I think by and large, however we can measure those things, numerically or however else, in the average situation, the typical situation, it would add to safety.

Mr. WILLIAMS. It would add to safety?

Mr. BAKKE. Yes, sir.

Mr. WILLIAMS. With that in mind, what objection could there be to placing a moral responsibility at least on these stations to so notify these planes?

Mr. BAKKE. Well, sir, because in some instances it may have an adverse effect. How much, I don't know.

Mr. WILLIAMS. Could you give us an example of where it might have an adverse effect?

Mr. BAKKE. Yes, sir.

I don't know the exact time, but somewhere around 2 o'clock in the afternoon approaching Washington National Airport, for instance, there are airplanes literally by the dozens within a 3-mile circle of Washington coming into Bolling, Anacostia, and Washington itself.

If you would try to visualize the process where somebody from the ground would keep you constantly advised of this airplane, and that one, and this one, with airplanes crossing in rather rapid sequence, I think you could see that the very time required to exchange the words necessary to add up to the picture of a collision hazard to your right, and then one to your left, and then one behind you, and then one ahead, simply isn't as expeditious; it isn't nearly as effective as just a good pair of eyes and alert head looking outside the cockpit.

Mr. WILLIAMS. I realize, of course, there are practical limits. This area is a heavily congested area, as is the New York area and the Baltimore area. Of course, you have to make necessary adjustments for that kind of situation, but over open territory why shouldn't a moral responsibility be placed on the traffic-control people who have that knowledge to impart it to the flying aircraft?

Mr. BAKKE. My answer to that is that the responsibility to provide services which are required in any particular instance is one that is already assumed by the CAA.

I believe that they will explain in some detail the manner in which, and the policies under which services such as this type of advisory service, are furnished.

My only observation is that because of the many ramifications in the provision of this kind of service it be left discretionary.

There are clearly cases where it might be desirable that such a service be rendered. Well, under those cases discretion should be left with the operating agency to render the service.

The type of thing which makes it compulsory in every instance, regardless of the consequences, and I realize this is extreme, but that type of thing it seems to me would operate against the objective which we would seek here.

I am just suggesting that such a service is provided right now.

It is discretionary with the Administrator and I see no particular advantage in making it mandatory.

Mr. HARRIS. Mr. Springer.

Mr. SPRINGER. Mr. Bakke, just to review this shortly and see if I can bring it up to date, when this one airplane—I am talking about this accident—took off from Los Angeles—and where did the other one take off from?

Mr. BAKKE. I really don't know. I am informed the same airport. However, I am not certain. I have not investigated the accident.

Mr. SPRINGER. At what altitude was United authorized to fly?

Mr. BAKKE. I have no knowledge of that, sir.

Mr. SPRINGER. You have no knowledge?

Mr. BAKKE. No, sir.

Mr. SPRINGER. Nor as to what the other one was to fly at?

Mr. BAKKE. No, sir.

Mr. SPRINGER. Let's assume just for the moment that they authorized one of them at 18,000 and one at 20,000 feet. When they got into this approximate area it is my understanding that one or both of them asked permission to move to another altitude or to free itself from altitude restrictions. Can you answer that question?

Mr. BAKKE. I can answer, but from what I have read in the press and so on. I am informed that that is the case.

Mr. SPRINGER. That is what they did do; is that correct?

Mr. BAKKE. That is my understanding, sir.

Mr. SPRINGER. When they asked to move to another altitude were they, in common parlance, on what is known as "your own"?

Mr. BAAKE. I would have to know what the terms of the clearance were, sir. I would say this, and I am not certain that these are facts, but if the aircraft were operating under VFR conditions; that is, if they were in the clear, then they were on their own in the sense that they continually had the obligation to see and avoid other aircraft, and this is irrespective of what instructions or clearances were given them.

Mr. SPRINGER. When they ask permission to move from a stratified zone such as 18,000, their clearance, so to speak, to move to something else and they, so called, are on their own, do they make a report of their conditions back to the air-control tower before that permission is given to move out of that range?

Mr. BAKKE. No, sir; I know of no such procedure. I would expect that if air traffic control needed that information it would request it.

Mr. SPRINGER. We will just say that I am flying the plane and you

are in the air control tower and I am flying at 18,000 feet, so I request permission to move out of that range.

So-called, then, I am on my own by visibility; is that not true? Is that not what your statement was, that you are on your own and you are supposed to look out for airplanes that are either moving in or coming toward you, or are at the sides; is that true?

Mr. BAKKE. Yes, sir. When you are flying in VFR conditions, you are responsible to see and avoid other aircraft; yes, sir.

Mr. SPRINGER. If you are the control-tower man and I asked that, you do not say, "What are the visibility conditions?"

Mr. BAKKE. Typically a controlled does not ask that; that is correct.

Mr. SPRINGER. So then he moves, we will say, then, to 19,000 instead of 18,000. Does he tell the control tower back there he is moving to 19,000 feet?

Mr. BAKKE. Not unless he is asked for that information; no, sir.

Mr. SPRINGER. Then the one that is flying at 20,000 feet asks to get out of the control area and so he says, "I want to move out of this," and the control tower says, "All right, you can move out."

Is that true?

Mr. BAKKE. That may be so, sir. That is quite possible.

Mr. SPRINGER. Then neither airplane then after they have moved out of their assigned altitudes necessarily will know whether or not the other airplane has moved to its altitude, or not; is that so?

Mr. BAKKE. That is correct.

Mr. SPRINGER. But as to the airplane captain who requests that information, the responsibility is on him to determine that his visibility conditions are such that he and his crew can see any airplane approaching in any direction?

Mr. BAKKE. That is precisely so, sir.

Mr. SPRINGER. That is his responsibility under your present regulations?

Mr. BAKKE. Yes, sir.

Mr. SPRINGER. There is no responsibility—I want to be sure of this—upon the control tower once he moves out of there; is that true?

Mr. BAKKE. That is correct, sir.

Mr. SPRINGER. I take it that your theory, from what you have said here today, is that since the captain of that plane requests that authority and moves off into some other area that is not controlled, first of all, he does that on his best judgment; that he can under the circumstances see sufficiently that his aircraft will be safe at all times, he and his crew; is that true?

Mr. BAKKE. That is correct, sir.

Mr. SPRINGER. It is your theory now, then, since he moves into another airspace, that he, therefore, has there at his own hand all of the equipment that is needed—I am talking in the way of visibility and knowledge—and that is necessary for him to operate that aircraft safely?

Mr. BAKKE. So long as he remains in VFR conditions, so long as he remains in conditions in which he may see and avoid other aircraft; yes, sir.

Mr. SPRINGER. All right.

Therefore, it is not necessary for the control tower to advise him of the fact that another aircraft or aircraft may be approaching?

Mr. BAKKE. That is correct, sir.

Mr. SPRINGER. He can at all times see those aircraft approaching. Therefore, there is no need for warning; is that true?

Mr. BAKKE. Yes.

Mr. SPRINGER. That is the theory upon which your present recommendation operates; is that true?

Mr. BAKKE. That is correct.

Mr. SPRINGER. I do not know what type of aircraft this was, but just last fall I was approaching the London Airport at 9 o'clock in the morning and it was rather hazy, but it was clear and you could see a good distance, not any 15 miles by any means. I went forward, stood at the back of the cabin, and watched the crew as it approached this airport for some 20 miles, long before you could see the airport.

The pilot was watching. The captain was on the left and the copilot was on the right. There was an engineer who was in the center and there was one other aircraft member on the right.

As I looked at it there just that day it looked to me as though two were watching to the left and two to the right. I take it there is no plan by which you watch for airplanes under these conditions, or is there a plan?

Mr. BAKKE. If you mean a sharing of responsibility among crew members——

Mr. SPRINGER. Yes, sir.

Mr. BAKKE. There is none specified, sir. It is presumed it will be up to the discretion of the pilot and the command. He will take the necessary steps to insure that there is always surveillance in the flight path.

Mr. SPRINGER. As we did approach there were several other airplanes, 1 which flew across our path in the front and I can recall at least 2 on the right and 1 on the left during that 20-mile flight.

I recall very distinctly that there was nothing said about any other airplanes in the vicinity, but they did keep telling them how they were and what the conditions were at the airport, and so on.

However, it is your theory that in those circumstances where there was visibility for this pilot and his crew to see, nothing could be added by saying to the captain of this airplane that there were four other airplanes flying parallel approaching or crossing his path.

Mr. BAKKE. No, sir; that is not quite correct.

Mr. SPRINGER. All right, would you explain that?

Mr. BAKKE. Yes, sir.

What I said, and my view, is that there are instances where that type of advisory service may be of benefit to the crew. It may be appreciated, accepted by, and used by the crew.

There are other instances in which the crew will regard that type of information as somewhat of an intrusion, as a bother, and the reaction will be "I wish they would leave me alone. I am looking for these aircraft and I don't want to be diverted. I don't want to have my attention diverted for this type of thing."

I don't think that we should categorically label this service, this advisory service, as bad. I think it would be improper. I think it would be poor judgment on our part to do that.

The only issue to which I directed the committee's attention earlier was with respect to making the service mandatory, should we by regulations in all instances require that such a service be given, and it is my view at the moment that this would be a mistake.

Mr. SPRINGER. Now, let us come right back to the Grand Canyon at this point.

In that instance, as I understand it, one of the airplanes—I do not know which one it was—was advised by the control tower that there was another airplane—and it was the other airplane which finally crashed with it—approaching at approximately the same altitude at a certain tangent; is that true?

Mr. BAKKE. I have been informed that that is the case. I have no direct knowledge.

Mr. SPRINGER. But the other airplane was not so advised; is that true?

Mr. BAKKE. I have also been so informed. I have no direct knowledge on that.

Mr. SPRINGER. Then what actually did happen at Los Angeles—I take it, it was Los Angeles, but if it was not it will not make any difference—was they exercised their judgment in that instance, did they not, as to who they thought should be advised; is that true?

Mr. BAKKE. Apparently so, sir.

Mr. SPRINGER. And apparently they did exercise their discretion in this matter when they so advised the one airplane; is that not true?

Mr. BAKKE. Apparently so.

Mr. SPRINGER. I do not know the rules of the road, but when you are sailing a boat when you are approaching another craft the sailing boat always has the right-of-way whether it is approaching from the left or from the right, because it does not have the same control that a steam- or gasoline-operated-engine boat does.

Now, I take it in using that discretion something of the same rule must have been observed; am I right?

Mr. BAKKE. I don't know that the principle of aircraft priority was involved in exercising that discretion; no, sir.

I would doubt that it was, but I don't know.

Mr. SPRINGER. Now, I want to come back, if I may, to your point again. If this were made mandatory I am assuming that this is what you believe. That if it were made mandatory by a rule, or it was so inserted in the regulations that that ground control operation centered a moral duty to advise the airplane that there were other aircraft or several aircraft in his immediate area flying at roughly the same altitudes, there are instances in which it would do a great deal of harm or might result in another accident.

Mr. BAKKE. Yes, sir. I think there are instances in which that kind of procedure if followed mandatorily would be harmful.

Mr. SPRINGER. I assume, Mr. Bakke, that you are referring to those instances where if there were several aircraft approaching and this were repeated in many instances, that the airplane crew would take the position that they were overloaded and possibly through their communications system could be diverted from the responsibility they have to observe these aircraft flying immediately in their vicinity in any direction.

Mr. BAKKE. Well, sir, this I use as an illustration, and as an illustration only:

It is by no means the exclusive effect which this type of procedure would have. There are many, many other effects and perhaps just

as meaningful. With the preoccupation of control personnel themselves, in order to provide to all aircraft at all times this kind of service, it would be necessary to extend our communications services, the coordination of this kind of information between stations on the ground. There would not only be preoccupation in the cockpit.
to cut you off. I am not thinking about the ground control personnel. Additional services mean additional facilities and additional people.

Unless you provide additional services and additional people, it results in an additional workload on existing people, and air traffic is an area within which an additional workload is not desired at the moment.

Mr. SPRINGER. Let me interrupt you, Mr. Bakke, and I do not want to cut you off. I am not thinking about the ground control personnel. If that is needed, I think the Congress will supply it.

I want to know what the action is going to be on those people who are in the airplane, the crew itself, flying. That is the point involved here because, as I see it, we could supply the information if that is necessary to get more ground personnel to do it, but what I want to know is, is it going to have a constructive effect on the crew itself? Is it going to overload the communications system if this is done?

I would think in this particular instance it would not because here they are flying at considerable distance from any airport or any concentrated area. In the Washington area or the Chicago area, which is the businest in the country, if you rendered this type of service I am wondering what effect it would have upon the crew. Oftentimes you have a dozen flights in the air in Chicago waiting to land.

Mr. BAKKE. Sir, to make it a responsibility on the controller that this information be furnished to pilots means that the controller must insure himself that the communication is in fact received. This means that not only must he give the information but he must expect acknowledgement each time such a message is sent.

The copilot must reach for the mike or otherwise transmit that message to the ground station. In an area in which there is a great deal of this kind of conversation, one member of the crew would be busy constantly acknowledging this type of thing. It is the sum of all these little requirements, the little requirement of turning around and reaching for a mike and making a communication. It is the sum of all those, plus dozens of others that are like them, that results in the kinds of preoccupation which we say defeats the see-and-be-seen concept.

All we have to do is add up all these diversions, and there are many outside the field of communications, and we have the pilot so preoccupied with bits and pieces that he does not have time to see where he is going. This is the measure that we attempt to apply in situations like this.

Mr. SPRINGER. I am going to assume that this is true or that is your belief.

As I understand, this action occurred in the nighttime; is that true?

Mr. BAKKE. That is not my understanding, sir.

Mr. SPRINGER. At approximately what hour did it occur?

Mr. BAKKE. I heard someone else here at the meeting say it occurred at 11:31, sir, but I have no direct knowledge.

Mr. SPRINGER. In the morning? In the morning; all right. I understood it occurred, not having this other testimony, I understood it occurred at night.

Now, would he be allowed, when requested, to remove himself from this assigned area at night?

Mr. BAKKE. There would have been no differences, sir——

Mr. SPRINGER. Nighttime or daytime?

Mr. BAKKE. Yes, sir.

Mr. SPRINGER. In other words, his duty at night to see is the same as it is in the daytime?

Mr. BAKKE. Yes, sir.

Mr. SPRINGER. Even though his visibility is severely limited at night over what it is in the daytime?

Mr. BAKKE. Technically, the visibility is not limited by darkness. By definition, visibility is merely the distance one can see. It happens to be a light in darkness.

Mr. SPRINGER. I do not think you could see a light in the night as far as you could see it in the daytime.

Mr. BAKKE. To the contrary, our anticollision lights may be seen at night quite a distance greater than you could see the aircraft in the daytime.

Mr. SPRINGER. I think that is all, Mr. Chairman.

Mr. HARRIS. Mr. Rogers?

Mr. ROGERS. Mr. Bakke, as I understand it, your organization has made a thorough investigation of the situation there at Grand Canyon, have they not?

Mr. BAKKE. When you say "our organization," I presume you mean the Civil Aeronautics Board?

Mr. ROGERS. Well, no, I mean your organization, your Bureau of Safety Regulations.

Mr. BAKKE. I would hardly say it's complete, sir. Normally we could not consider an investigation to have been complete until we see the final pronouncement by the Board of all of the findings of its investigation and the probable cause. Our Bureau does not participate directly in that; so I would say that a complete investigation is in process by the Board.

Mr. ROGERS. That disturbs me. I never understood that before. I was very interested in your answers to Mr. Springer's questions, in which you said you did not know anything about the time or anything concerning this accident. What occurs to me is this:

If that is true, your statement here is that the Bureau of Safety Regulations is that organization within the Board which carries out the staff responsibilities for the development of civil air regulations. Now, if your statement is complete about this situation, then your development of civil air regulations must rest upon hearsay testimony, being that pronouncement by other divisions of the Civil Aeronautics Board which you turn to in order to determine air regulations; is that correct?

Mr. BAKKE. Well, it is not entirely correct, sir. It is correct only in the sense that by far the bulk of the accident investigation function is accomplished by the Bureau of Safety Investigation. It is that part of the Civil Aeronautics Board whose staff collects the testimony and the evidence, who prepares the reports which we then review.

The bulk of this work, by far the bulk, is accomplished by the Bureau of Safety Investigation. Our Bureau typically furnishes at least one observer who sits in on the investigation, but principally in an observer capacity, so that he might determine and so report through the Bureau as early as possible any results of the investigations that have direct implications with respect to our safety regulations.

Mr. ROGERS. Your safety regulations, then, would be the result of recommendations of those who took active part in the investigation outside of your one observer?

Mr. BAKKE. In very considerable part; yes, sir.

Mr. ROGERS. That does disturb me because I think, and I understood at Las Vegas when we were having hearings, that the Safety Regulations Division or Bureau was to go and take an active part in the Grand Canyon accident investigation.

I wanted to ask you some questions during this hearing, but you may not have the answers. One of those was this, and I will ask it, although I am concerned that if it is answered it must rest upon hearsay, so to speak, and that is this:

Has your organization reached a definite conclusion as to the cause of the occurrence over the Grand Canyon which resulted in those 128 deaths?

Mr. BAKKE. I can answer that, sir, rather categorically, "No."

Mr. ROGERS. You mean it has not reached a definite conclusion?

Mr. BAKKE. That is correct, sir.

Mr. ROGERS. When do you expect to?

Mr. BAKKE. I have no knowledge of that.

Mr. ROGERS. Do you not think, Mr. Bakke, that if you are going to have charge of setting up safety regulations that the only way in the world you can determine whether or not there was a regulation change needed, or whether or not a regulation was violated, that you ought to have complete knowledge of what happened sufficient to at least base a conclusion on, as to the actions of those two airlines?

Mr. BAKKE. I think that is a fair statement, sir. What you have asked with respect to the pronouncement of final cause is, of course, something that relates very directly to a specific formal proceeding or process within the Board. The Board in due course obtains a report recommended by its investigatory staff, and after consideration of that report on a specific date, will adopt a probable cause.

Now, what I am saying to this committee is that that process has not run its course yet. It has not been completed.

The Board has not as yet adopted a final report of this action.

Mr. ROGERS. I am not talking of the Board, I am talking about the Bureau of Safety Regulations which has to do with the development of civil air regulations. My concern is this: That if you are going to set up safety regulations, certainly it would be in order for you to determine whether or not there had been a violation of a present safety regulation that caused the accident over the Grand Canyon, would it not?

Mr. BAKKE. Well, as a matter of fact, as a staff function, that happens to be one of the things that we do require of the observer who participates in the early investigation and hearing.

Mr. ROGERS. You require what of him; whether or not there has been a violation of a safety regulation?

Mr. BAKKE. Yes; whether there is an apparent violation, sir; we will put it that way. We send an observer to participate in this early portion of the investigation and the hearings in order to determine the extent to which our regualtions might have been involved in this accident, whether there is a deficiency in the regulation disclosed or whether there is an apparent misunderstanding or disregard of our regulations or however our regulations might have been affected.

If one of the manners in which our regluations were affected was the disregard by a pilot of literal requirement of a rule, it so happens that kind of of thing, that disregard, is a violation. Ours is not an enforcement obligation, but we do want to know how our rules are working and this is one of the functions which our observer performs.

Mr. ROGERS. That is one of the very points I am coming to in keeping with Mr. Mack's observation, and I had an experience yesterday at the State Department. There is entirely too much shifting of responsibility and no one seems to have authority or responsibility.

The trouble about the thing is, there were 128 lives lost in this occurrence and I think certainly it is incumbent upon the Government agencies that have control of air traffic to determine whether or not there was some violation or some something that caused or had something to do with an accident of that kind without any more delay than is absolutely necessary, because certainly, if another one of those things happens because of the violation of a regulation which might have been violated in that instance, it would be hardly answerable to the general public that this was a regulation that was violated and we should have known about it but we did not because we were not so advised by our observer or other person from whom we get information. That is the thing that concerns us so deeply.

Mr. Bakke, does the possible legal implications or responsibilities of the parties involved in this accident have anything to do in determining what happened or what did not happen from the standpoint of safety or pronouncement by the Board?

Mr. BAKKE. No, sir; I think not.

Mr. ROGERS. The matters are not determined and then kept classified until personal or private responsibilities of the parties involved are settled?

Mr. BAKKE. No, sir.

I know of the operation of no such element in the accident investigation picture.

Mr. ROGERS. I am hoping that that is correct.

Have you ever reached a definite conclusion in this particular situation as to the altitude these planes were flying at the time they apparently collided?

Mr. BAKKE. Well, sir, as I stated before, and I do not know how better to answer that question, I am informed concerning them. I have read various reports, for instance. I was not present at the hearing. I have not reviewed the sworn testimony.

Mr. ROGERS. You mean you were not present at the hearing and you are Deputy Director of the Bureau of Safety Regulations?

Mr. BAKKE. Well, sir, I was out of the city at the time.

Mr. ROGERS. I know, but it seems to me that with 128 lives involved in the situation, it would have been incumbent on someone in authority in this safety area to be present.

Mr. BAKKE. I would agree, and there was; the Director was there, our Chief of the General Rules Division was there.

Mr. ROGERS. Did they reach any conclusion, do you know, as to the altitude these planes were flying at the time of the accident?

Mr. BAKKE. I am sure they did, sir.

Mr. ROGERS. Have they made that public or known?

Mr. BAKKE. No, sir. There would be no occasion to make that type of thing public.

Mr. ROGERS. Well, have they told you?

Mr. BAKKE. No, sir.

Mr. ROGERS. I would like to have it come to me, either by hearsay or direct some way, if they did have such information. The point further is simply this: That regardless of what altitude those pilots were flying at that time, or whether on IFR or VFR clearance, they would not have been in violation of the safety regulations promulgated by your Bureau, insofar as controlled altitude clearance.

Mr. BAKKE. I am not sure that that conclusion is at all correct, sir. There is a distinct possibility that the right-of-way rules of the Civil Air Regulations might have been involved.

Mr. ROGERS. Suppose I confine my question to the proposition insofar as their altitude clearance was concerned. They could fly at any altitude they wanted to as long as they were not on airways; could they not?

Mr. BAKKE. No, sir; not at any altitude. We have certain minimum altitude requirements.

Mr. ROGERS. I understand that.

I am talking about the clearance that they received from Los Angeles. They were not bound to fly at 19,000 feet or at 1,000 feet above the top when they were not traveling on airways; were they?

Mr. BAKKE. They were bound to fly 1,000 feet on top; that is, the one aircraft which was instructed to remain 1,000 feet on top was bound to remain 1,000 feet on top only so long as he was in controlled airspace.

Mr. ROGERS. That simply means that when he got off the airway he could come down 3,000 feet if he was not violating any other regulations?

Mr. BAKKE. So far as restriction of air traffic control is concerned, that is right.

Mr. ROGERS. The other plan that was on IFR had the right to do the same thing as long as he was not on a controlled airway?

Mr. BAKKE. That is correct.

Mr. ROGERS. So whatever altitude they were flying at that time, insofar as their control situation was concerned is being cleared at certain altitudes on airways they would not have been in violation of your regulations, safety regulations?

Mr. BAKKE. That is correct.

Mr. ROGERS. There has been no finding, as I understand you, as to whether or not they were in—either pilot was in—violation of any other safety regulation?

Mr. BAKKE. That is correct, sir.

Mr. ROGERS. When can we expect a finding of that kind? Can you give us any indication?

Mr. BAKKE. No, sir; I cannot.

I think the answer to that question is not indicative, and this is obviously a personal view, but it is not indicative of the lack of procedure for covering this type of thing. I think it is merely a measure of the complexity of this particular accident investigation.

I think it is unfortunate that we have as little information as is available concerning the precise altitude, the relative attitudes of the aircraft at the time of impact, and that type of thing.

Mr. ROGERS. Do you not think, though, Mr. Bakke, that the very fact that you mentioned there, the lack of information, should spur on the Government agencies because the reason we do not have any information is because there are no survivors? The chances are, we never will get any information if we look to direct testimony because crises of that kind are never going to leave any survivors.

Mr. BAKKE. I wonder, sir, if it would be helpful if I explained this: That regardless of the completeness of our investigation or the decisiveness of some conclusion with respect to some probable cause, in the mind of every one of us involved in safety regulation, typically there is a process of supposing. We create for ourselves suppositions.

We suppose these two aircraft were in such-and-such relative attitudes or conditions of flight. We ask ourselves what we then might expect or whether it is at all reasonable to suppose that this kind of condition might be frequently encountered.

I think this type of thing, sir, goes on all the time and when we find, when we are able to put together, bits and pieces of information, even though they may not be directly responsive to this particular accident, we do find sufficient reason to initiate notices of proposed rulemaking or otherwise work toward the amendment of our civil air regulations.

It so happens that the particular cause of this specific accident, so far as I am aware, has not yet been determined and has proved particularly difficult to determine.

Mr. ROGERS. I understand that.

Has there been any change in regulations—any addition to the regulations or any subtraction from the present regulations—with respect or due to this accident out there?

Mr. BAKKE. No, sir; there has been no completed regulatory work resulting from anything which, to my knowledge, came out of the Grand Canyon accident investigation.

Mr. ROGERS. Has there been any regulation or part of a regulation or any order of any kind telling pilots not to fly down and sightsee over the Grand Canyon since this accident?

Mr. BAKKE. No, sir; there has not.

Mr. ROGERS. Has there been a policy adopted by the commercial airlines flying in that vicinity to stop doing that?

Mr. BAKKE. Not to my knowledge, sir.

Mr. ROGERS. Have you consulted with them about it, Mr. Bakke?

Mr. BAKKE. We have, sir, but in a very informal vein. We have not formally requested verification, for instance, from the air carriers themselves.

Mr. ROGERS. Are you aware that that practice was going on prior to this accident?

Mr. BAKKE. Yes, sir; we were.

Mr. ROGERS. Do you know whether it is still going on or not?

Mr. BAKKE. I assume it is. I have no positive knowledge of that.

Mr. ROGERS. Well, have you or any of the others who are concerned with the investigation considered the fact that this tragedy could have resulted from that practice?

Mr. BAKKE. That is one of the many possibilities, you might say, that we have explored; yes, sir.

Mr. ROGERS. Do you not think that until it is determined that it was not caused by that practice it would be good policy for your organization at least to recommend or develop a safety regulation that those planes quit doing that?

Mr BAKKE. Well, that is a difficult question to answer, sir, because it happens to be one of the things that we are right now in the process of weighing.

I would say that, had you asked that question perhaps a week or two from now, I might have been able to give you a complete answer. Now the best I can do right now is to say that is one of the elements which is being considered by the Bureau right at the moment.

Mr. ROGERS. Let me say this: That if it was caused by that practice, I sincerely hope that the Board will not wait a week or two to prohibit the continuance of it. If they think it has any remote, casual connection the practice should stop. Even the remoteness of it would not deter me from feeling that it should be stopped unless there is some safety regulation adopted to control it.

I believe that is all I have, Mr. Chairman.

Thank you.

Mr. HARRIS. Mr. Williams?

Mr. WILLIAMS. Mr. Bakke, it is quite difficult for me to get away from the idea that there may have been some responsibility, to some degree, resting on the shoulders of CAA ground people to alert these two aircraft to the fact that they were in the same vicinity at the same altitude at the same time, in spite of the explanations that you have made to the effect that such notification might cause confusion.

Mr. SPRINGER. Might I ask a question at that point?

Mr. WILLIAMS. Yes.

Mr. SPRINGER. I want to be sure.

My understanding is that one of the aircraft was notified.

Mr. WILLIAMS. That is right.

Mr. SPRINGER. So your statement is that it was the duty of the ground controller to notify the other aircraft.

Mr. WILLIAMS. Yes; morally, at least.

Mr. HARRIS. So there will be no misunderstanding about it, as I recall the testimony, the one that was notified was notified through their own station back in California at Los Angeles.

Mr. SPRINGER. Control tower at Los Angeles?

Mr. HARRIS. Through their own station in Los Angeles when he requested to go from 19,000 to 21,000 feet, which was denied.

Then he requested to go 1,000 feet over the top and at that time he was advised by his own station through the Los Angeles controller that United Air Lines was his traffic. That is the way he was notified.

Mr. SPRINGER. What did you say there? I did not understand it.

Mr. HARRIS. He was advised, when given permission to go 1,000 feet over the top, that United Air Lines was his traffic.

Mr. SPRINGER. That means he had permission. What does traffic mean?

Mr. HARRIS. Aircraft in the same area.

Mr. SPRINGER. I see.

Mr. HARRIS. So the TWA plane went up that way and was notified that it was in United Air Lines traffic.

Mr. WILLIAMS. But, as I recall, that was at the time of change of clearance, changing his clearance from IFR 19,000 to 1,000 on top, I believe. It is rather difficult for me to understand why there should be some objection to placing some kind of obligation on these people to so notify these planes when they have knowledge of that fact and when the planes are in the very same area flying, at least in this particular case, a converging course at the same altitude and virtually at the same speed.

I realize that the CAB and the CAA both necessarily place a lot of flexibility in the hands of the pilot with respect to responsibility and they expect the pilot to use what they term the highest degree of judgment in meeting conditions as they confront him while he is in the air.

To what extent is the same yardstick applied in the case of the ground controllers to exercise what you refer to as the highest degree of judgment?

Mr. BAKKE. My answer would, of course, be an opinion which would be, I would say, somewhat outside of my own particular professional cognizance. I mean, I typically do not develop policy or participate in the development of policy or procedure in this particular field.

Mr. WILLIAMS. I asked you, of course, as an expert in your field.

Mr. BAKKE. I would say that there is no lesser responsibility on the controller.

Mr. WILLIAMS. No less responsibility?

Mr. BAKKE. Yes, sir.

Mr. WILLIAMS. Would you say that in the history of civil aviation there has ever been an accident that might be attributable to the error or lack of judgment or lack of exercise of judgment by ground controllers?

Mr. BAKKE. I know of none, sir. I am not sure that I got your whole question, whether you included in that lack of judgment or error on the part of the controller had in any way contributed. If that were part of your question, then I would say that there have been accidents in which error, perhaps error in the judgment on the part of controllers, has been part of a causative chain which resulted in an accident. I know of none in which, for instance, the lack of judgment or error on the part of the controller has been the probable cause, for instance.

Mr. WILLIAMS. Mr. Bakke, how long have you been in your present position?

Mr. BAKKE. Well, as Deputy Director, for a little over a year.

Mr. WILLIAMS. A little over a year?

Mr. BAKKE. About a year and a half?

Mr. WILLIAMS. How long have you worked with the Bureau of Safety Regulation with CAB?

Mr. BAKKE. Since its inception in 1948 and before that, with its predecessor bureau, the Safety Bureau.

Mr. WILLIAMS. Then I assume that you have been in this field for quite some time?

Mr. BAKKE. Eleven years in a technical capacity with the Civil Aeronautics Board.

Mr. WILLIAMS. That should qualify you as an expert on the basis of experience. I am quite sure you have had rather wide experience in investigating many civil air accidents. Usually, these investigations result in attributing the accident to 1 of 3 causes: Mechanical failure, weather, or pilot error.

Of course, when it is attributed to pilot error, that means that the pilot exercised bad judgment in the handling of his aircraft.

In all of the investigations that you have made, and in all of the investigations that you have ever known, have you ever known one single air accident to be attributed to the error of judgment on the part of the ground controller?

Mr. BAKKE. I have known of accidents in which errors of judgment of control personnel were a part, as I say, a contributing factor or otherwise a part, of the causative chain which led to the accident; yes. There are none in which the error on the part of the controller was flatly described as the probable cause. I know of none.

Mr. WILLIAMS. Then, on the basis of what you have told this committee, I can assume that we may not expect any to be charged to ground controller error in the future?

Mr. BAKKE. I certainly do not look for any, sir, and I say that this speaks particularly highly of a very excellent job done by the Air Traffic Control Agency of the CAA.

Mr. WILLIAMS. Well, in the manner in which you delegate responsibility, it would be impossible to place the blame or the probable cause in the hands of the ground controllers; would it not?

Mr. BAKKE. Oh, no, sir; by no means.

Mr. WILLIAMS. Have you not in this testimony before this committee absolved them of all responsibility in the exercise of their judgment?

Mr. BAKKE. No, sir; only with respect to the provision of this advisory service.

With respect actually to the assignment of altitudes, to the determination that adequate horizontal and longitudinal clearance between aircraft exists, with respect to the types of clearances, the procedures required to be followed and that type of thing, the responsibility is clearly on the shoulders of the CAA. The act puts it on them.

We do not compromise that responsibility in any way. I think they carry a very, very heavy burden of responsibility.

Mr. WILLIAMS. Is it conceivable that failure on the part of a responsible CAA official to notify two aircraft that they were at the same altitude flying converging courses at approximately the same altitude, at the same speed, might be a contributory cause of an accident?

Mr. BAKKE. I find it very difficult to answer that any other way but "no," because to answer that any other way but "no," I would first have to find that there is no responsibility in the cockpit for it. I simply refuse to admit that the man on whom we rely most for safe aircraft separation is to be relieved of his responsibility for avoiding a collision. The day that comes, we will have lost the most effective control that we have over a collision avoidance.

Mr. WILLIAMS. I did not mean to indicate that the pilots should be relieved of all responsibility. However, I can conceive of a case, and I am quite sure you will agree with me, of an overtaking airplane flying

above the slower airplane and letting down in altitude where both pilots would be unable to see each other, thereby colliding.

Mr. BAKKE. Sir, even there——

Mr. WILLIAMS. Do you not think that such conditions should be anticipated by the CAA when they have knowledge that two planes are in the same area at the same time under circumstances such as those prevailing in the case of the canyon collision?

Mr. BAKKE. I think factors like that should without any question be considered by the CAA. I think it is the consideration of factors like these which is implicit in my comment earlier when I said that the Administrator or the CAA should be given discretion with respect to the issuance of this kind of advisory. When he sees situations like the one you described, he then should be moved to furnish this advisory service.

But just one other point in passing. Even then, I would still insist, even though it appears like a rather arbitrary position, that there is no one in the aviation industry who knows better how blind an airplane is in descent and climb than the pilot. No one else better than the man flying that airplane knows the limitations of cockpit visibility. If he has to stand that plane on his ear to see, I think the mandate is that he do that or he does not proceed.

The day that we can conclude that there exists the type of thing over which the pilot has absolutely no control, and, secondly, that the probability is sufficiently great that that type of thing will produce an accident, it would be mandatory on the part of the Board to prohibit it, in my judgment.

Mr. WILLIAMS. You do not mean to say that you think, because the pilots' visibility is seriously limited in climbing and letting down, that all climbs and letdowns should be done by climbing turns and descending turns, do you?

Mr. BAKKE. No, sir; I do not think that is necessary.

Mr. WILLIAMS. In answer to that, can you see any possible objection to placing the responsibility on the ground controllers to exercise, in the same manner that the pilot must, their highest degree of judgment?

Mr. BAKKE. Judgment?

Mr. WILLIAMS. Such as whether they should convey information to pilots of the presence of other aircraft in the area, when they know such condition to exist?

Mr. BAKKE. None whatever, sir.

Mr. WILLIAMS. Then, on that basis, do you still feel that it was not necessarily incumbent, morally at least, upon the ground controllers to so inform both planes in the canyon case that there were other planes in the same area at the same altitude at the same time?

Mr. BAKKE. Well, sir, I do not believe I answered that particular question earlier.

On that, I am afraid I am going to have to hedge. I try as best I can to put myself in the position of the two men and ask myself whether, sitting here now, I have enough information as to what confronted them, what their other demands were, how much other communications business they had, how many other activities were required of them of a higher priority than this particular thing.

These are things which I cannot judge sitting at this table. I just do not know whether, with my present convictions, I would have con-

cluded differently than did either the communications personnel or the control personnel who were involved in this accident.

Mr. WILLIAMS. Mr. Bakke, would there be any reason why this could not be done as a practical matter; that is, to impose upon your controllers the responsibility to do so when conditions permit?

Mr. BAKKE. I would see no particular difficulty in that type of policy.

Mr. WILLIAMS. Here is the thing that disturbs me about the canyon accident, that is, that no amount of radar or any of our other navigational equipment could, or, as a practical matter, would have prevented this accident. However, the mere notification of the UAL plane as well as the TWA plane that there was another aircraft in the same area at the same time flying a converging course might conceivably have alerted those pilots to the point of having prevented this accident. It is for that reason that I ask these questions, not by any means being critical of the CAB for not having promulgated rules since that time.

That is all, Mr. Chairman.

Mr. HARRIS. Mr. Bakke, you would think after this session of questions by other members of the committee that I probably would not have any, but I do have some questions in my mind that I do not want to be repetitious any more than necessary.

In the first place, you have explained that you are the deputy director of the Bureau of Safety Regulations, which comes under the authority of the Board.

Now, your appearance here today, the technical information that you have given describing the activities of your own Bureau, the responsibility of the Board and discussion of the act itself is of course very enlightening.

You have expressed a good many opinions which I am personally interested in and I know a lot of other people were, too. In your appearance here today, you represent the Board; do you not?

Mr. BAKKE. Yes, sir.

Mr. HARRIS. The opinions that you have expressed, along with the description and explanation of the functions and obligations and responsibilities, are those of the Board?

Mr. BAKKE. Well, sir, I have tried in each instance, and I may have slipped in many, but I have tried in each instance to identify those opinions which, in response to the question, I found it advisable to make as my own when they were my own.

I think I could fairly say that what I have said here may be accepted as an official spokesman of the Civil Aeronautics Board, except in those instances when I found it necessary to distinguish my own personal opinion.

Mr. HARRIS. It is pretty difficult now to recall just which ones you did state were your own opinions, but I will ask you about some of them.

When the Board reached its conclusions, for whom you speak here, were those opinions generally unanimous? Did they all feel the same about it?

Mr. BAKKE. This is with respect, for instance, to the promulgation of safety regulations?

Mr. HARRIS. Yes.

Mr. BAKKE. Not at all times, sir. At times there are differences.

Mr. HARRIS. How long has it been since there has been any major change in safety regulations?

Mr. BAKKE. Well, sir, perhaps the most recent major change that I can think of occurred about, oh, 6 weeks ago, the revision of part 20. It was 2 weeks ago that it was actually adopted.

Part 20 is that part of the Civil Air Regulations which deals with the certification of student pilots, private pilots, commercial pilots, and specifies the requirements for the issuance of various ratings such as the instrument rating.

Mr. HARRIS. Yes, then that has to do with certification, but I am talking about the major change with reference to safety regulations affecting the airways and traffic control.

Mr. BAKKE. Well, the last major overhaul of part 60 was, I believe, in 1947.

Mr. HARRIS. 1947?

Mr. BAKKE. Yes, sir. Since that time, there have been several changes to part 60. I do not know that I could identify any one in particular as being a major change, however. I think this is a rather gradual process of improvement which has principally been done in spot amendments of part 60.

Mr. HARRIS. Is it fair to say, or is it a fact, that we are operating practically under the same rules and regulations insofar as air-traffic controls and airways are concerned, other than the change in 1947 since the early part of 1940 or shortly after the CAA Act was passed by Congress in sufficient time to get it underway?

Mr. BAKKE. I do not think that that would be entirely correct, sir. I think we can say this: that the principal distinctions between the IFR and VFR operations, which I described in the statement that I presented earlier, are today essentially as they have been for the last 15 years.

I think we can say that the basic structure of part 60 has remained unchanged. There have been many changes which have made our air-traffic rules look different in some respects, but the basic requirements of the part are substantially the same as they have been for 15 years.

Mr. HARRIS. Airways are substantially the same as they were 15 years ago; is that true?

Mr. BAKKE. Perhaps not 15 years.

Mr. HARRIS. How long?

Mr. BAKKE. Well, we narrowed them down to 10 miles from 20, and I would say perhaps quadrupled or perhaps more the extent of the coverage of the system.

Again, the type of control exercised over aircraft on our airways system is basically the same. There have been many refinements, but basically it is the same type of control; yes, sir.

Mr. HARRIS. In other words, what I want to know, basically and generally speaking, we are using the same type of controls, rules, and regulations, of airplanes today in the airways with the type of modern airplane as we used some 15 years ago when we had the small and slow airplane.

Mr. BAKKE. Well, sir, I merely have to state again that much of the bases, much of the foundation, both for the rules and the air-traffic-control system, are the same.

Mr. HARRIS. All right.

Now, when, if you know, are we going to fully realize and wake up to the fact that with jets coming on, you cannot drive a Cadillac under the same rules and regulations that you operated the horse and buggy?

Mr. BAKKE. I think applying that analogy to aviation, we have realized that a long while, sir.

Mr. HARRIS. So far as I know, in the years that I have had experience in these matters in listening and as an observer on this committee, about the only real active change and consideration that was given since the Reorganization Act in early 1940 was when we had the big fight between those interested in the old ILS system versus GCA.

Do you remember that?

Mr. BAKKE. I remember that very well.

Mr. HARRIS. That was about 1947, the time you spoke of that there were some major changes; is that true?

Mr. BAKKE. Yes, sir.

This, of course, is part of the types of differences which I tried to explain before. The machinery has changed a great deal. The types of tools that the CAA is using for air traffic control function are much different today than they were 15 years ago.

Mr. HARRIS. Yes, but according to your testimony, the Civil Aeronautics Act charges the Board with a certain duty, and then you went ahead and outlined that duty. Then you stated the policy of course had a lot to do with the rules and regulations and that in carrying out the control functions, the Board and Administrator must consider public convenience and necessity, and then you explained, quoting this language:

> There is hereby recognized and declared to exist in behalf of any citizen in the United States the public right for freedom in transit in air commerce through navigable airspace of the United States.

Obviously that has a great deal of weight on the Board in making any changes or agreeing or deciding on any changes. Is that true?

Mr. BAKKE. Very much, sir.

Mr. HARRIS. How can you recognize this policy of the freedom of the air with jets traveling through the air at 600 or 700 miles an hour?

Mr. BAKKE. Well, sir, the answer to that is such things as the quadrantal altitude system, such things as speed restriction in high density areas, slowing the jets down to 180 miles an hour when they come to the Washington area.

Mr. HARRIS. Can you slow the jets down to 180 miles an hour?

Mr. BAKKE. Yes, sir.

The Board has in process now a notice of proposed rulemaking which has been coordinated with all users of airspace, and we find that there is virtual unanimity among users of airspace that there should be such slowing down of the users of the airspace.

Mr. HARRIS. You also continue to hold to the policy of see and be seen as the program of the day?

Mr. BAKKE. Yes, sir.

Mr. HARRIS. You always want to adhere to that?

Mr. BAKKE. No, sir.

The Board, as we said in the statement, will drop see and be seen at such time as 1 of 2 things begin to happen: It becomes apparent that, notwithstanding the ability to see, there still is not the capacity

to avoid collision. We see that coming in high altitude operations, and clearly our objective is applying full, positive control eventually at high altitudes. That is one of the things that we are working toward right at the moment.

Now we think that there is a possibility we may have to do that in certain high density areas. These are the two fields which I described might require a more complete treatment than is presently given our traffic separation requirements under see and be seen. Gradually, then, we will ask ourselves how far must these high density areas be established and how low must the high altitude be brought?

Conceivably, it could be brought down or the high density areas could be extended to cover the United States as a whole. We clearly look eventually in certain areas for the dissolution of see-and-be-seen concept.

Mr. HARRIS. Well, then, you do, I judge from that, recognize that if a pilot can get a little help or information from some source it would be helpful to him?

Mr. BAKKE. Yes, sir; I have no quarrel with that.

Mr. HARRIS. Well, I must go back to questions that have been asked by several others here.

I cannot for the life of me see why the ground-control operator, when he knows two planes are at the same altitude, other than in the controlled high density areas, would not advise the pilots of the other traffic, just as a matter of precaution.

Mr. BAKKE. Well, sir, my answer to that is that generally, in my own judgment, it would be advisable for that type of service to be given. The Administrator, in offering the air traffic control service, should be permitted the discretion to provide such service when in his judgment it is advisable to do so.

Mr. HARRIS. That goes back now to the idea suggested by Mr. Rogers a moment ago.

In the course of the hearings at Las Vegas, the operator stationed at Needles was before the committee. He explained that he had just had a report at a given time from the TWA plane. It had gone on top of the overcast. I think it was over Mojave?

It was at an altitude of 21,000 feet. Within, I think, 3 minutes or a short time after that, the same station had a report from the United Airlines, and he was 21,000 feet. We asked him the question:

Why didn't you then notify United Airlines that you had a report from TWA that he was at 21,000 feet?

He said, "The regulation didn't require it," and he was right. It was not his fault, understand, because that is the procedure.

Now, I cannot see, in an instance like that, why the regulations should not require it. Now when you get into the high density areas around an airport like Washington, as was described a moment ago, to be sure he could not be saying, "Look out for the plane above you or below you," that is in an area where he had given clearance to come in and that is his right-of-way when he comes in, and it is an entirely different situation.

But when you get out in the open spaces, I, like some of the others who have expressed themselves, believe that to me it would be highly advisable for safety if such were made.

Now, it is the Board's responsibility to make the requirement, is it not?

Mr. BAKKE. Yes, sir. I think it would be in order to distinguish, however, the type of requirement which we might make. The Board does not write regulations which are in effect instructions to air traffic control personnel for the carrying out of air traffic control procedure. That, under the act, is clearly a function of the Administrator.

Mr. HARRIS. Yes, but you have to promulgate for the Administrator to act on?

Mr. BAKKE. Let us say that we may promulgate a regulation, sir, which would put a compulsion on the Administrator's personnel to provide this kind of service. The rule, however, would have to be directed to the user. We would have to say something to the effect that United aircraft may not proceed unless he has from the Administrator certain types of information.

In other words, we do not write the procedure for the communicator or the controller himself; we write the conditions under which——

Mr. HARRIS. Is it not a fact that the Administrator is not permitted, or cannot, as a matter of practical approach, request funds for this increased service if there is not some requirement for it?

Mr. BAKKE. Oh, no, sir; emphatically not.

Mr. HARRIS. If he had the regulation, it would be easier for him to get the funds, would it not?

Mr. BAKKE. Yes, if there were a regulatiton which prevented certain air-carrier operations from taking place without this service, he would then have the additional argument of economic impact in the event the service were not furnished.

Mr. HARRIS. You stated that the Board has had very favorable working relations with the CAA in development of air-traffic rules and air function?

Mr. BAKKE. Yes, sir.

Mr. HARRIS. Has the CAA asked the Board for any changes in rules and regulations?

Mr. BAKKE. Oh, yes, sir.

Mr. HARRIS. Have they asked for certain changes within the past several months and years which have been denied them?

Mr. BAKKE. I would say yes, sir.

Mr. HARRIS. Is there not, and has there not been for some time, a conflict in thinking of certain people in CAA and the CAB?

Mr. BAKKE. Well, my answer to that would be only the type of conflict that you would normally expect whenever you put two groups of rather sophisticated people together and discuss a complex subject which is fraught with so much controversy.

Mr. HARRIS. Understand that I am asking these questions, Mr. Bakke, simply for information and so that the facts may be brought out and not for any other purpose at all.

Mr. BAKKE. Yes, sir.

Mr. HARRIS. You mentioned a moment ago, or in the course of your testimony, that right now or last week the Board met with these many representatives. How long has it been since you had such a general meeting before last week?

Mr. BAKKE. Oh, we had a meeting just some months, I do not remember how many months, before that, with one particular group to discuss the same subject. We have this type of technical conference in other fields, airworthiness, for instance, annually.

Conferences of this sort, I would think we could safely say occur several times a year, but that this type of conference, that is, before the Board itself, on the air-traffic rules has probably not been had in recent years. The preceding meeting before the Board was one in which only the air carriers themselves were present. It was a presentation of the air-carrier problem with respect to air-traffic rules.

Mr. HARRIS. Well, now, is it not a fact that under the procedure heretofore over the years, that you try, and I can understand that if it is true, that you try to satisfy the air carriers when you make any major change or tighten up controls or agree on restrictions and so forth?

Mr. BAKKE. This is to satisfy the air carriers as distinguished from other interested persons?

Mr. HARRIS. As distinguished sometimes from the better judgment of people in your position and in government?

Mr. BAKKE. I would say emphatically no, sir.

Mr. HARRIS. Well, has it not been a fact that recently there have been more decisions made and more actions taken than there have been made in a long, long time before that in the many fields affecting safety?

Mr. BAKKE. There has been a steady increase in the total productivity of the Bureau now for the past several years. That increase is still going on. We could take the last 60 days and I daresay that there would be a greater productivity in the last 60 days than in those 60 days a year ago.

This has been a gradual improvement in the process of the Bureau and improvement in the quality of personnel.

Mr. HARRIS. How long have you been developing the 5-year plan? How long has the CAA, for example, been developing a 5-year plan?

Mr. BAKKE. The 5-year plan was submitted formally approximately 6 or 7 months ago, something of that sort. Here I would have to ask for help.

Mr. HARRIS. It has been several years in the making, has it not?

Mr. BAKKE. The 5-year plan?

Mr. HARRIS. Some plan. You did not know whether it was going to be a 5-year or what?

Mr. BAKKE. Of this I have no knowledge.

We have been familiar with CAA planning so far as their Federal airways are concerned, but it has not been until very recently that any cohesive set of proposals identified as the 5-year plan have come into existence.

Mr. HARRIS. Well, the Congress has taken on itself to develop the airport program, for example last year.

Now the 5-year airways plan has been reduced to 3 years. You have referred to that on several occasions here.

The question of air-navigation aids has been up in the air since 1950. For some reason, recently they have all gotten together, when I know the whole group have been at odds for a year or more since.

I mention this to point out and try to emphasze the fact when something happens that points up a need for something to be done, somebody moves. I think that is the important thing in this question of aviation.

With all these modern developments and new gadgets and electronic devices and jet airplanes and so forth, we cannot wait until these tragedies occur. We should not anyway.

I assume it is as much the responsibility of one as it is the other, even the Congress as it is the CAA or the CAB or the Air Transport Association. It is the responsibility of everyone. That, it seems to me, is the proximate cause of the great air tragedy that occurred in the Grand Canyon.

Now, why cannot an airway be established over that area?

Mr. BAKKE. I know of no reason why it cannot, sir.

Mr. HARRIS. But it has not been done.

Mr. BAKKE. Not to my knowledge; no, sir.

Mr. HARRIS. I see on the map here there are airways running all up and down?

Mr. BAKKE. The designation of civil airways, sir, is a direct function of the Administrator, which typically the Board does not play a part in.

Mr. HARRIS. I appreciate that. It seems to me we are going to have to have some more airways. The reason the commercial airlines want to go across there is because they can get there faster; is that not correct?

Mr. BAKKE. Presumably so, sir.

Mr. HARRIS. I want to ask you this question:

You do think that insofar as positive control, or at least cooperation ground to air, that it is a different situation with commercial airlines where people are riding and paying for it that it is the ordinary civilian airplane? Do you agree that there is a different situation there?

Mr. BAKKE. Well, yes, sir; there is a different situation. I do not know quite what significance to attach to the question, though, sir, as to whether you mean——

Mr. HARRIS. I mean insofar as making certain requirements which probably should not be applicable to some other planes.

Mr. BAKKE. Well, we have never distinguished as a group between the air carriers and nonair carriers in the application of any safety requirements.

M. HARRIS. I am asking you now:

Do you not think there should be?

Mr. BAKKE. I think not, sir. I see no reason why we may not continue to apply functional requirements. If we need additional communications, we will require additional communications. The air carriers are better able to furnish communications that nonair carriers, that is true. Such a requirement would probably be harder for the nonair carrier to accept, but if it can be justified, we will require it. I think we can state functional requirements to get our air traffic control job done, without necessarily distinguishing between——

Mr. HARRIS. Do you agree with what some people have referred to, that the airspace is being used up rapidly?

Mr. BAKKE. Yes, sir; in the sense in which I know that view has been expressed. I agree with it wholeheartedly.

Mr. HARRIS. All right, then, why would it not be advisable to overhaul the airways or revise them and then require commercial airlines to stay on airways?

Mr. BAKKE. Well, that might very well be possible, sir.

A large-scale revision of our present airway structure which would look toward the inclusion of all air carrier routes within controlled airspace, in my judgment, would require considerably greater number and type of facilities than are now available.

Mr. HARRIS. We just passed a big highway bill in Congress in order to meet the modern type of automobile and truck travel on the highways. Why should we not do the same thing for these modern airplanes that travel the airways?

Mr. BAKKE. Sir, I could think of no more happy solution if it were possible to develop the equivalent for airways.

Mr. HARRIS. Well, would there be anything, can you see from your experience in this field over the years, that with the development of aircraft we have today coming off and starting in 1959, do you see any obstacle to revising the airways and then providing the rule or requirement for the commercial airlines to stay on the airways? Of course, within certain altitudes.

Mr. BAKKE. No, sir; I see no technical obstacle, sir. I see an economic one. I see an obvious one of timing; namely, that regardless of what money is made available, it simply takes time to develop, but I see no technical obstacle to the fulfillment of that objective, none at all.

Mr. HARRIS. When we have some difficulty, we can do things.

For example, we had quite a program outlined here for 5 years and now the President came up and recommended $68 million in addition to the $48 million in order to expedite the program. When we see that it is in the interests of safety and the public, it can be done; can it not?

Mr. BAKKE. Yes, sir.

Mr. HARRIS. Do you place in the category of a gratuity or advisory service these facilities that we are spending all of this money to provide for safety?

Mr. BAKKE. Sir, I consider our Federal airway system an essential element of our national economy, and I say that without any qualification.

Mr. HARRIS. Well, I thoroughly agree, but you have referred to it first as gratuitous service, and then later as advisory service.

Mr. BAKKE. No, sir; this is only that provision of traffic information which is not mandatory under our present system of air traffic control. That I labeled as gratuitous. It is gratuitous in the sense that it is the type of service which an employee or a communicator or a controller in the air traffic control system may offer if time permits or if he sees the necessity for it.

Mr. WILLIAMS. Mr. Chairman, in that respect, and I hate to keep dwelling on this subject, but I can understand the obvious difficulties that would arise from any kind of mandatory provision requiring that they impart this information to these aircraft. Yet I can also understand how this information could contribute immeasurably to the safety of aircraft in flight; that is, being alerted to the fact that other aircraft are in the area.

You referred to this as gratuitous service.

Do you not think it would be much better, and it would be a contribution to the safety of civil aviation, if they went a little further than saying that they may do it, and to set forth that it is the policy of those who are charged with directing the air traffic, to impart that

information when they have it in hand and where practicable? In other words, put it on an affirmative basis? At least to admit that there is some moral responsibility on the part of ground controllers to do this, although I realize the impracticability of making it mandatory?

Mr. BAKKE. Well, sir, the pronouncement of that kind of policy would clearly be something that the Administrator would be called upon to do. The Board has formally raised this question with the Administrator, as I advised you earlier. We have agreed upon the exchange of information pertinent to this subject. This is still in process.

Mr. WILLIAMS. I realize that that would be in the hands of the Administrator.

You have had quite a bit of experience flying as well as in accident investigation and in safety regulations. Do you not feel that that would be the proper thing to do, to issue that type of policy or statement of policy?

Mr. BAKKE. Well, offhand, sir, the best I can do in reply to that question is to say that offhand I can see no reason why such a policy should not be adopted. I just do not have enough information at hand to be able to affirmatively find that such a policy would be required.

Mr. WILLIAMS. I am of the opinion that if such a policy had been in existence at the time of this crackup over the canyon that the ground controller at Needles, or wherever it was that they made their last report, would have felt it incumbent upon him to some extent to notify both planes that there were other planes in the area at the time they checked in, rather than to assume that that was not his responsibility at all.

I am thinking that there is a possibility, however remote, that had that information been imparted to UAL that those two planes might not have cracked up, and with that in mind, of course, I think the issuance of such a policy would certainly be justified if it would conceivably save one life. It would be well justified, and I am quite sure you agree with me in that.

Mr. HARRIS. Mr. Bakke, I want to thank you for the committee for your testimony here today. I believe that this very frank discussion we had after your explanation on behalf of the Board emphasizes the importance of these hearings.

I certainly believe in a policy of freedom insofar as possible. I can well understand how one in your position and others feel that as long as they can operate themselves, use their better judgment, the whole program will be better.

On the other hand, I am fully convinced that the airways, like any other modern developments, have to be improved and the control facilities have to be improved and increased as they will be.

I am convinced that the personnel has to have more attention and increased to carry out these functions. I am convinced that we have to have better airports in order to take care of this traffic.

I am also convinced that the heavier the traffic, the greater we must acknowledge the restrictions. That is true in any field, whatever it is. That is the reason we have the greater restrictions around the

airports where aircraft are coming in and going out, all of these go hand in hand with the program if we are going to have the safety in the air as I know the American people are going to demand.

I personally appreciate your testimony and expression of views here. We have kept you a long time but I believe it will be helpful to this program.

Is there anything further?

The committee will adjourn until 10 o'clock in the morning, at which time we will have Mr. Pyle, Acting Administrator.

(Whereupon, at 4:40 p. m., the commmittee recessed, to reconvene at 10 a. m., Wednesday, September 12, 1956.)

AIRSPACE USE STUDY

WEDNESDAY, SEPTEMBER 12, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON TRANSPORTATION AND COMMUNICATIONS
OF THE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D. C.

The subcommittee met at 10 a. m., pursuant to recess, in room 1334 of the House Office Building, Hon. Oren Harris (chairman of the subcommittee) presiding.

Mr. HARRIS. The subcommittee will be in order.

Resuming the hearings this morning, our first witness will be Mr. James T. Pyle, Acting Administrator for the Civil Aeronautics Administration.

Mr. Pyle?

STATEMENTS OF JAMES T. PYLE, ACTING ADMINISTRATOR, CIVIL AERONAUTICS ADMINISTRATION; DAVID THOMAS, DIRECTOR OF AIR TRAFFIC CONTROL DIVISION; JOSEPH TIPPETS, DIRECTOR OF THE OFFICE OF AIR NAVIGATION FACILITIES; AND WILLIAM DAVIS, DIRECTOR OF THE OFFICE OF FLIGHT OPERATIONS AND AIRWORTHINESS

Mr. PYLE. Mr. Chairman, thank you.

If I might, I would like to preface my statement by the sincere expression of regret on the passing of Carl Hinshaw and I would like to inform the committee how deeply, myself personally, and the people in our agency feel on Carl's passing on. I have had a great many personal contacts with him and I think they were some of the richest experiences I have enjoyed in all the time I have spent in aviation. I know how keenly you feel about his not being with you any longer.

I would also like to express my regret on the passing of Chuck Lowen. We are going to miss him down there at the agency, and all I can say as Acting Administrator is that we would like the committee to know that we are going to carry on the programs and policies which Mr. Lowen established and in which we all thoroughly concur, and we would like you to know that. I would like you to have my personal assurances because they are progressive, those plans, and they are getting at the problems with which we are all concerned.

Mr. HARRIS. I did not know until Monday when Mr. Rothschild told me that Mr. Lowen had passed on. I am sorry I had not known about it.

Mr. PYLE. Probably that was my fault; I should have let you know.

Mr. HARRIS. I did not mean that. I was not expecting you to do it. Unfortunately, I had not seen it and we are all very sorry about it.

Mr. PYLE. Mr. Chairman, then if I might proceed with my statement?

Mr. HARRIS. You may proceed with your statement.

Mr. PYLE. I am James T. Pyle, the Acting Administrator of Civil Aeronautics. I am very pleased at the opportunity to appear before this committee and to provide you with such information as you desire in this vital field of air transportation.

I have a prepared statement which is designed to cover the areas that you, Mr. Harris, indicated you would like covered by your letter of July 20, 1956, to the Secretary of Commerce. For convenience, I think it perhaps best if I take the items in the order set forth in your letter.

I also have present in the committee room the heads of the various offices concerned in the Civil Aeronautics Administration's operations, and in the event that more detailed information is requested that I have readily available, with your permission I will consult my office heads, or ask that they answer the committee's questions.

With your permission, I will now discuss the first item.

Mr. HARRIS. Mr. Pyle, I would like for the record to identify your associates who are here with you.

Mr. PYLE. All right, sir.

Mr. David Thomas, Director of the Office of Air Traffic Control; Mr. Joseph Tippets, Director of the Office of Air Navigation Facilities; Mr. William Davis, Director of the Office of Flight Operations and Airworthiness. We also have on call, Mr. Chairman, the personnel officer and the Director of the Office of Airports, but we felt perhaps the questioning this morning would not get into those areas and we would be here this afternoon. However, they can be heard immdeiately if you so desire.

Mr. HARRIS. That is all right.

Mr. PYLE. With your permission, I will now discuss the first item: "The present air-traffic-control system and how it is operated within the regulatory framework."

The basic function of air-traffic control is to provide for the safe, efficient, and expeditious movement of aircraft on landing areas and in the controlled airspace. Stated more simply, the basic purpose of air-traffic control is the same as that of surface-vehicle traffic control; namely, protection of life and property by avoidance of collisions. There are protective rules and regulations for both air traffic and ground traffic which are designed to prevent accidents. These "rules of the road" are not in themselves sufficient to insure safety when either congestion of traffic is such that right-of-way rules do not suffice, or when vision is obstructed by clouds to make conformance with right-of-way rules impossible. Separation between aircraft must be provided by air-traffic control when pilots cannot provide their own.

In describing further the air-traffic-control system and the manner in which it functions, it would be best to start with the regulatory framework on which it is based. The Civil Aeronautics Board under

its safety rulemaking authority has prescribed the air-traffic rules which apply to aircraft using the airspace over the United States and its Territories and possessions. These rules appear in part 60 of the Civil Air Regulations and air-traffic control is exercised under their provisions.

The first and dominant principle which is expressed in these rules is that air-traffic control is provided in only a portion of the total airspace and then only under certain condtions. It is only within what is called controlled airspace that the Administrator is called upon to furnish air-traffic control and that aircraft are required to operate under its instructions and clearances. Outside of controlled airspace, no air-traffic separation through the medium of air-traffic control is authorized or provided.

Controlled airspace is divided into two categories: control zones and control areas. The extent and location of these zones and areas are designated by the Administrator pursuant to delegated authority and are published in the Federal Register and other publications so that the public will be informed of them. A control zone, by definition, extends from the ground upward and embraces the airspace in the vicinity of one or more airports. Within such a control zone air-traffic control is normally provided to aircraft which are taking off or landing at the airports involved. Under the air-traffic rules, a pilot operating aircraft on and in the vicinity of airports where an air-traffic-control tower is in operation is required to maintain visual or radio contact with the tower and to comply with the instructions given him.

The second type of controlled airspace, a control area, by definition extends upward from an altitude of 700 feet above the surface. The airspace covered by the Federal civil airways system is normally designated as control areas and air-traffic control is exercised within the area boundaries.

Mr. Chairman, I would like to point out one deletion that we made there in the statement. For the record, we deleted the word "civil" because the airspace does not apply only to the civil. The word crept in there inadvertently.

At this point I think it well to identify the second major principle expressed in the air-traffic rules insofar as air-traffic control is concerned. This principle is that whether he is in controlled airspace or out of it, it is assumed a pilot will provide his own separation from other air traffic when conditions are such that he may reasonably be expected to do so.

It is this principle which is reflected in the distinction drawn between visual flight rules and instrument flight rules. Thus the test as to whether aircraft must be operated under visual flight rules or the instrument flight rules is made to depend on the weather and atmospheric conditions, since these affect the pilot's ability to see and be seen by the pilots of other aircraft.

Therefore, to remain under the less restrictive visual flight rules, an aircraft must be operated a certain minimum distance from clouds, and the pilot must have a certain minimum of forward visibility. If these specified requirements are not met, then the more restrictive instrument flight rules become applicable.

In order to compensate for the pilot's inability to provide his own separation under IFR conditions, the essential requirement of the instrument flight rules is that an aircraft will not take off from a point within a control zone or enter a control zone or control area unless an IFR flight plan has first been filed with air-traffic control and an air-traffic clearance obtained from them. Armed with such a clearance, the pilot operating under the instrument flight rules is protected against collision with other aircraft which are also operating in compliance with the instrument flight rules while both are within the controlled airspace.

It should be noted that both of the two major principles mentioned before are here operative. It is only entry into or operation within controlled airspace under IFR conditions that requires an IFR traffic clearance and that clearance is effective only within the controlled airspace and against other IFR traffic. Thus, if a flight is operated outside of controlled airspace, it receives no protection from an air traffic clearance while outside, and even while in controlled airspace is not protected against aircraft operating under VFR conditions.

An example may make this clearer.

Normally an aircraft under instrument flight rules is given an assigned altitude as part of its air-traffic clearance. It is required to fly at that altitude while within the control area. This altitude might well be in good weather either above or below the clouds. Under those conditions, with good visibility, it is entirely possible that another aircraft may be at the identical altitude operating legally under the visual flight rules.

The air-traffic rules contemplate that the pilots of both aircraft will be responsible to see and avoid the other; the IFR aircraft is not protected by his clearance from the VFR aircraft.

Similarly, if an aircraft operating under the instrument-flight rules leaves the controlled airspace, his air-traffic clearance provides him no protection against other aircraft while outside the controlled airspace. His reentry into controlled airspace is protected against other IFR aircraft at the assigned altitude given him in his traffic clearance, but while outside he is not protected by that clearance from any other aircraft that might be using the uncontrolled airspace in that vicinity.

There is one other aspect of this regulatory scheme which might deserve comment.

As indicated, normally, an assigned altitude is given an aircraft under instrument-flight rules as part of its air-traffic clearance. However, a pilot may request or be given in lieu of an assigned altitude a clearance specifying "at least 1,000 feet on top." This type of clearance is still an IFR air traffic clearance and within controlled airspace is obligatory on the pilot receiving it.

With such a clearance, he may not operate within controlled airspace unless he maintains at least that specified separation from the cloud deck. However, since such a clearance presupposes that he is and will remain in a position to see and be seen by pilots of other aircraft, he is expected to provide his own separation from whatever other aircraft are encountered and that they will do likewise.

With that explanation of the regulatory framework of air-traffic control, I will now describe the air-traffic-control system and the functions of the various parts of the system.

There are three major components of the air-traffic-control system: The air route traffic-control centers, the airport traffic-control towers, and the airways communications stations.

There are 31 air route traffic-control centers, 182 airport traffic-control towers, and 357 airway communications stations. These are all tied together with landline communications so that the information necessary to operate the system flows freely within or between these three components.

Some idea of the extent of the system may be gathered from the fact that connecting all of these air-traffic-control facilities are some 75,000 miles of full-time telephone lines and over 100,000 miles of teletypewriter lines.

Each of the three basic components has its own function to perform in the operation of this system. The air route traffic-control centers are responsible for the control of instrument air traffic operating in the controlled airspace.

The airport traffic-control towers provide the necessary means of control on and in the vicinity of airports. In some instances, they also assist the air traffic-control centers by providing control to the initial stages of flight of departing instrument-flight traffic and the final stages of flight for such traffic arriving at the airports.

The airway communication stations furnish ground air communications services and also serve as mediums to release aeronautical information necessary to the safe and efficient conduct of flight operations as well as collecting and disseminating aeronautical weather information.

Together the three units combine into an integrated air-traffic-control system.

The actual control of en route traffic using the airways under instrument-flight conditions is accomplished by providing separation either in space or time. Aircraft operate generally at assigned altitudes where the aircraft is provided either with vertical separation from other aircraft or is protected by application of a time or distance separation from other aircraft.

In order to assure the requisite degree of safety, aircraft proceeding in the same direction at the same altitude are given a 10-minutes separation from other aircraft. This time separation is considered essential in order to take care of variable factors that must be accounted for when continuous position information is not immediately available to the controller.

The aircraft are required to make position reports at certain designated points along the airways by reference to ground navigation facilities which mark fixed geographical locations. Therefore, in order to accommodate the possibility of errors in estimating the arrival at the next reporting position in order to accommodate delays in communications between the aircraft and the controller, and other variable and unknowable factors, it is necessary that the 10 minutes separation be adhered to.

Applying this 10-minutes time separation to actual flight operations means that in the case of two DC–3 type aircraft, with an esti-

mated speed of approximately 180 miles an hour, they will normally be separated by 30 miles.

Applying the same standard to modern four-engine air-carrier equipment, the geographical separation will be between 60 and 70 miles. The same time separation applied to jet aircraft would necessitate a geographical separation of approximately 100 miles.

Obviously, it would be desirable if this relatively wasteful use of airspace could be reduced, but without radar it is not possible to do so if the present high standards of safety are to be maintained. We know that by the use of radar the 10-minute separation standard may be substantially reduced without adversely affecting safety.

For example, within the terminal areas where we have available radar equipment to provide separation, we are able to utilize a 3-mile separation of aircraft at the same altitudes. Where radar is available for the control of en route traffic, we are able to authorize an aircraft to pass through the assigned altitude of another aircraft with only a 5-mile separation.

We do not at this time know the exact degree of separation which we will be able to use on en route traffic if radar were available over the entire system, but we do know that it will be reduced substantially below the present minimum separation standard.

The airway traffic control system now being operated is a good system and is a safe system. It now handles far more traffic than any other air-traffic control system in operation anywhere in the world, but under the existing conditions it is not adequate to meet all the demands placed upon it without imposing extensive delays on the users. The system served adequately until the military expansion following the Korean war and the unprecedented upswing in scheduled air carrier and business aircraft operations created a demand for additional air traffic control services which we have not been able to meet.

The flexibility of operations inherent in the use of modern pressurized air carrier aircraft, the increasing volume of military jet aircraft, and the tremendous spurt in business flying resulted in an unprecedented system load.

For example: Every 1½ seconds there is a landing or takeoff somewhere in the country under control of the CAA air-traffic-control services.

At the Chicago Midway Airport, during the calendar year 1955, a landing or takeoff was accomplished every 82 seconds on the average around the clock, day in and day out, for the entire year.

At our own Washington National Airport, traffic at that same rate was handled through a 24-hour period recently.

With the existing equipment and existing facilities, the system can no longer absorb additional loads without either expanding the system or creating more delays. We are aware of the inadequacies and we know the cure. The inadequacies may be summarized as—

1. Lack of enough geographical coverage;
2. Lack of sufficient personnel;
3. Lack of sufficient communications facilities, radar, and navigation facilities;

4. A diversity of ground navigation systems which result in system inefficiencies;

5. A lack of airborne navigation and communications equipment; and

6. Inadequate research and development on new control devices.

Our air-traffic-control-improvement plan has taken all of these inadequacies into account, and will cure them, if implemented, to the extent they are curable by governmental action alone.

The plan is designed to increase the capacity of the system fourfold, provided airport capacity keeps pace with air-traffic-control capacity. The entire system is an integrated whole and all elements of aviation must contribute to the perfection of the system which is now the best in the world, but which undoubtedly can be made better.

The second subject is: "An outline of the proposed plan to expand the system and what results are to be expected from such expansion."

Mr. HARRIS. Do you happen to have a chart with you showing the system all over the country?

Mr. PYLE. Yes, I think we have it. I would like Mr. Tippets, if we can, after this statement, to answer any questions you may have about specifics. I think he can explain them much better than I can.

The traffic-control system depends on a widespread system of visual and electronic aids to navigation and landing; the system serves both civil and military aircraft. This system of aids dates from July 1, 1926, when the Commerce Department acquired a very limited airway system which had been operated by the Post Office Department for the airmail service. The facilities included rotating beacon lights, gas blinkers, emergency landing fields, and point-to-point radio communication stations.

From the beginning, the emphasis has been on developing and installing facilities which are disposed and located so as to form unified pattern of regular interaction or interdependence; an organized whole as opposed to a helter-skelter disposition.

The immediate postwar years of civil aviation expansion resulted in the concept of a common system of airway aids and traffic control for use by both military and civil aviation, and the Air Coordinating Committee (ACC) was established by the President to coordinate the many requirements for aviation facilities.

Early in 1947 the ACC requested the Radio Technical Commission for Aeronautics (RTCA) to make a study of air traffic control for the purpose of developing recommendations for the safe control of expanding air traffic.

Special Committee 31 of RTCA was composed of all aviation segments of government and industry, and on May 12, 1948, its report (the famous SC–31 report) was published. It contained traffic-control principles, and a set of timed recommendations concerning equipment to do the job. The interim common system was to bridge the transition to the ultimate common system, and the blueprint was acceped by government and industry.

Congress responded with increased appropriations for common system items in 1949 and 1950, and the cumulative value at the end of fiscal year 1956 was about $70 million, nearly half of which had been appropriated prior to the SC–31 report.

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The following is a listing of the number of facilities in operation on December 31, 1955:

Facilities as of Dec. 31, 1955, regions 1–6

Miles of Victor Airways	81,000
Miles of Victor Airways including alternate routes	109,000
Omniranges	418
Low frequency ranges	344
DME	234
ASR	31
ILS	157
Nondirectional radio beacons	175
Fan markers	226
Intermediate (D-type) fields	71
Airway light beacons	837
Approach lighting (all types)	103
Airway communication stations	357
Airport traffic control towers	182
Air route traffic control centers	31

Mr. HALE. Will you explain right there what Victor is?

Mr. PYLE. They are airways designated by very high frequency radio facilities, Mr. Hale. In other words, this is a line-of-sight system that is static-free as compared to the low-frequency facility which, under certain atmospheric conditions, is almost unusable.

The low-frequency facility is the old radio range, the four-course range. This is a new concept which has an infinite number of radials on which the pilot can tune in and steer to or from a station. It is static-free in the very high frequency band of the radio spectrum.

Mr. ROGERS. Mr. Chairman, I do not want to burden the record, but I think it would be good if Mr. Pyle would explain these different items that are listed here.

Mr. HARRIS. All right.

Mr. HALE. Most of them are fairly technical, like these initials. I do not know what a fan marker is. I agree with Mr. Rogers that a little explanation would be helpful.

Mr. PYLE. Shall I do that?

Mr. HARRIS. Yes.

Mr. PYLE. The Victor Airways, as I explained to Mr. Hale, is the system of airways which are delineated by the very high frequency omniranges. The omniranges, the item immediately below, of which there are 418 in operation, are those radio navigational aids which set forth in most instances the Victor Airways.

There are also certain facilities that are used at airports and are not necessarily part of the airway structure. The low-frequency ranges are the ones that are in the low-frequency band. They are the old four-course band. They are used as navigational aids and are also used for the delineation of the low-frequency airways or, as we know them in the industry, the colored airway system.

However, we are beginning to phase those out as we can because we feel the other is a much more practicable and useful system of navigation. It is static-free. It is one of the greatest advantages that it has.

Mr. HARRIS. Do you operate the high-frequency and low-frequency station at the same place?

Mr. PYLE. In certain instances they are, or as closely together as they can be. In other instances they are separate airways, Mr. Chairman.

The DME is the distance-measuring equipment.

The ASR is the airport surveillance radar, which is a radar of comparatively limited range, approximately 30 to 50 miles and not too high-altitude coverage, which is used at an airport and forms part of the airport or the approach control facility and is part of the airport traffic control tower.

Mr. HARRIS. What is it again?

Mr. PYLE. Airport surveillance radar.

Mr. HALE. I notice there are not many of them.

Mr. PYLE. No, sir. That is one area where we have to put additional ones in, and we are so planning.

Mr. HALE. I should think you would need them, many hundreds.

Mr. PYLE. We are planning to put many additional in.

Mr. Tippets can speak to the exact figures on that point, Mr. Hale. You are quite correct; we need many more.

The ILS is the instrument landing system which, of course, is installed at an airport to guide the pilot down on his final approach.

Mr. ROGERS. Now, Mr. Pyle, that is more or less obsolete where you have the ASR; is it not?

Mr. PYLE. No, sir; the ASR guides the pilot to where he intercepts the instrument landing system.

Mr. ROGERS. I see.

Mr. PYLE. And he flies down the beam.

The ASR does not give altitude, so we only use it to vector him or direct him to that point at which he intercepts the instrument landing system.

Mr. ROGERS. But in your contact with the plane, you do by voice determine his altitude as to where he should be or should not be?

Mr. PYLE. We monitor his altitude and we clear him to a certain specified altitude. He reports his altitude. So there is a working relationship between the pilot and the controller to be sure that he maintains his altitude.

Mr. ROGERS. Is there a combination of ASR and ILS?

Mr. PYLE. No, sir; there is the GCA. That is a system that takes the plane down and covers him both as to his direction and as to his altitude. That is the GCA system.

Nondirectional radio beacons. Those are merely a beacon that emits a signal on which the pilot, through the automatic directional finder, can tell whether he is headed to the beacon or what his bearing is with respect to that particular facility.

Mr. HALE. May I interrupt?

Is that nondirectional radio beacon a beacon that flashes?

Mr. PYLE. No, sir; it emits a radio signal. It is used, for instance, on an airway as an additional aid to assist the pilot in determining his exact position.

Mr. HALE. What good is it if it is not directional?

Mr. PYLE. He knows when he passes over it on the airway. He therefore can fix his position on the airway. He knows he is over the nondirectional, we call them H facility, at say between—I cannot think of one offhand, but there are some down in Virginia. We know then that he has passed that.

We also use them for approach control procedures. Riverdale, for instance, has an H facility. The standard departure out of Washington is to home in on the Riverdale beacon and then from there the plane is vectored or sent somewhere else. It is merely an additional aid. It is perhaps like a lighthouse for a ship.

Mr. ROGERS. Would the gentleman yield?

Mr. HALE. Yes.

Mr. ROGERS. Is it directional to the extent that it grows louder as you approach it?

Mr. PYLE. That can give the pilot a false sense. Actually, that is the case. As you get closer to it, it will get louder, but there are certain other things that also cause that same situation due to the peculiarities of radio propagation. So a pilot does not depend on that necessarily. It is not as modern, for instance, as the omnirange. It is an older technique. It is a very reliable one but, for instance, it is affected by static. It is a low-frequency radio beam, or not beam, but signal. As such, it is affected by static and thunderstorms, for instance.

A fan marker is a high-frequency device which emits a signal but it is directional. It goes straight up in the air so when a pilot passes through that area through which the signal has been emitted, he knows he is over that position. It is used primarily in the vicinity of airports so he can tell he is 10 miles or 20 miles or whatever the position of that fan marker is away from his airport or destination. It is a high-frequency device. It both emits a signal which you can hear through your headphones, as well as lights a light on the dash.

Mr. HALE. Suppose a pilot is coming into the Washington Airport and he gets a signal from a fan marker; does he know where the fan marker is?

Mr. PYLE. Yes, sir; that is marked on his chart and he knows——

Mr. HALE. He knows from his chart where the marker is on the ground?

Mr. PYLE. Yes, sir.

Mr. HALE. But can he tell from the signal what direction he is from the marker?

Mr. PYLE. He is directly overhead.

Mr. HALE. He would not hear it unless he were right overhead?

Mr. PYLE. Well, within a few degrees, to be absolutely honest. You cannot make it absolutely directional.

Mr. HALE. It is like a channel buoy in sea navigation?

Mr. PYLE. Except that you can see a channel buoy for a considerable distance. The fan marker, insofar as the pilot is concerned, is within a very few number of degrees directly overhead the station. If it were completely overhead and a very narrow beam, he might miss it, so it has been expanded slightly.

But the principal function or mission is to show where he is with respect to that station. That in turn tells him how far he is from the airport or whatever distance he is interested in. It may be another facility.

Intermediate fields go back into history. They were fields that were established principally in the days when single-engine aircraft, airmail aircraft, were used and they are gradually being phased out as the need is reduced for their maintenance. They are relatively small fields, emergency operating fields.

Mr. ROGERS. Those are the ones just for emergency landings?

Mr. PYLE. Yes.

Mr. ROGERS. Cross country. I think we had one out at Twitty, Tex., between Amarillo and Oklahoma City.

Mr. PYLE. I will have to accept your word.

Mr. MACK. Approximately how many of those do you have?

Mr. PYLE. After December 31, 1955, there were 71 in operation.

The airway light beacons are the beacons which I am sure you have seen. Those originated in the early days of airmail service when radio was not nearly as adequate as it is now. Those are being phased out. We keep them in operation primarily to meet the needs of the private pilot. In certain instances they serve a useful purpose for departure control.

Approach lighting, you will notice the designation "all types." Various types of approach lighting, high intensity lights, I am sure you have seen them as you make landings at airports. They are neon lights. We have developed a new system with the help of industry which is a little different configuration.

The basic mission is to assist the pilot on a low-altitude approach to find the end of the airport runway. They extend anywhere from 1,000 to 3,000 feet out from the end of the runway and direct him in to the landing area.

Mr. ROGERS. Should not that item be expanded?

Mr. PYLE. Yes, sir; we are working hard on that. One of the problems, frankly, Mr. Rogers, is to develop a standard that we know is absolutely foolproof, in which both the air carrier industry and the military agree meets their requirements. This has been a very real problem and I think we are on the threshold of adopting a common standard.

We are deeply appreciative that the Airline Pilots Association and the military have done so much to assist us.

Mr. ROGERS. Once you reach that common standard, it would not be a difficult problem to expand this particular item; would it?

Mr. PYLE. No, sir. It is a matter then of getting the appropriations and the equipment and putting it in.

The airway communications stations are those stations throughout the United States in which our operators provide air-ground and ground-air communication service for aircraft—airline, military, private pilot, business aircraft, and so forth.

They also transmit weather information to the aircraft. In other words, they are the link between the aircraft and the ground and are operated by our agency.

Airport traffic-control towers, I think, is self-explanatory. Those are those towers which we operate and the basic criterion is 24,000 itinerant operations in a year, which qualifies that city for a tower. This criterion was approved by the Air Coordinating Committee.

The air-route traffic-control centers are, of course, those centers from which our personnel issue the clearances for the aircraft, the instrument flight clearances.

Mr. HALE. Is that figure 31 there purely fortuitous as compared to the figure 31 for ASR?

Mr. PYLE. Yes, sir; entirely. It is just a matter of coincidence, Mr. Hale. These are all determined on separation of the country into geographical areas trying to equalize to the extent possible the load

in each one of these centers. We will, from time to time, readjust the boundaries.

For instance, we will put another in operation because we feel that part of the country is getting more traffic and, as a result, we want to distribute that area, put in another center to take off the load from some of the other areas surrounding it. But it is done on a geographical basis.

Mr. ROGERS. Mr. Pyle, airport traffic-control towers, 182. That does not include the tower that is at each airport; does it?

Mr. PYLE. Yes, sir.

In other words, that would include the Washington tower.

Mr. ROGERS. You need a lot more of those?

Mr. PYLE. It is determined, sir, on the basis of the number of operations at an airport. If an airport has 24,000 or more itinerant operations, it immediately qualifies for a tower.

Now, there are certain instances when we can see from the curve that an airport is going to get into that area.

Mr. ROGERS. Can they have the tower without the operations?

Mr. PYLE. We are not in a position to fund it; that is the problem.

Mr. ROGERS. I understand it. If the local people pay for it, they can have it?

Mr. PYLE. We would be tickled to death.

Mr. HARRIS. What did you say the requirement was for a tower?

Mr. PYLE. 24,000 itinerant operations per annum.

Mr. HARRIS. 24,000?

Mr. PYLE. Yes.

Mr. HARRIS. What does that mean, 24,000 operations?

Mr. PYLE. Takeoffs and landings at an airport, including all types except purely local operations.

For instance, it would include training types of aircraft, air carrier, military. All the statistics are collected, and if it qualifies under those numbers of operations, it then qualifies for a traffic-control tower. In certain instances, we do anticipate a community reaching that type or volume of operations, and in this case we may put it in a little before so that when we hit that figure, we will be ready for them.

Mr. MACK. When the cities provide their own tower service, would you put them in on loan or are you reimbursed for your employees' working in there, or how is it done?

Mr. PYLE. I want to give you the correct answer on that. I would like to ask Mr. Tippets for that information.

Mr. TIPPETS. Mr. Chairman, I am J. H. Tippets, Director of Air Navigation Facilities.

The procedure is that a city, in anticipation of enough traffic to warrant an operation of a tower by our Office of Air Traffic Control, usually applies through the Federal-aid airport program for expansion of its existing structure, and when that structure is available, and the 24,000 annual itinerant operations are met, then the CAA, anticipating this, will go to the Congress and request establishment funds for the establishment of a tower, and usually the year following that appropriation we request the operational funds to be operated by the Federal Government.

Now, in some instances cities have towers, do not meet our criteria, and they have had us operate it on a reimbursable basis, because they do not meet the Federal criteria.

Mr. MACK. Thank you.

Mr. HARRIS. I believe you have one more, air-route traffic-control centers.

Mr. PYLE. Those are the centers that actually direct the instrument flight operations. In other words, that is where the control is.

For instance, at Las Vegas you talked to the controllers from Salt Lake and Los Angeles; they came from the control centers.

Mr. HARRIS. As I understand, Mr. Tippets will describe and explain that operation further after you have concluded your statement?

Mr. PYLE. If you wish, sir.

The CAA has published the Federal airway plan, outlining an improvement program proposed for the next 5 years to meet the rapidly increasing tempo and amount of civil and military aviation activity.

The present Federal airway plan is designed to use more of certain techniques and equipments already in partial operation. The plan provides for increase in traffic capacity of improvements in three broad areas:

1. Radar.
2. Communications.
3. Navigation aids.

Radar provides a means for the traffic controller to "see" the aircraft under his control, rather than having to visualize their positions by means of written estimates of position arranged on a display rack.

We need two kinds of radar to accomplish better utilization of the airspace. In the en route area we will install long-range radars to see all aircraft above 15,000 feet, wherever they are, and to control aircraft below that altitude on densely traveled routes.

The plan provides for 73 such radars, and the military radars which comprise the SAGE system of air defense will be used whenever they are sited in such a manner that the information can be used for traffic-control purposes as well.

Use of military radar involves a careful study of the cost of sending the information by landline or radio to CAA control centers, versus the cost of installing separate ATC, or air-traffic control radars, of our own.

I would like to interject here the importance of this for use in air defense, because we feel that this is a very, very important part, not only from the standpoint of our agency, but also the country as a whole.

I am delighted to be able to report that, because of Mr. Tippet's effective work out at Colorado Springs during the past year, and particularly within the last week, we have been able to work up what I feel is a plan and a program, and a group of men from both agencies, the Air Defense Command and our own, who will achieve the ultimate in this integration.

I think this is a highly significant thing for the country as a whole. We are going to make the best use of the radar information that we have in the interests of achieving the very objective we are all interested in, better traffic control. So, I am gratified that I can tell you about this now because it is a fact.

Mr. HARRIS. We are very glad to have this information.

Mr. PYLE. We can discuss it in further detail later.

Mr. HARRIS. I would like to hear more about it. I would like to hear particularly about the integration phase of it. I do not know what you call it, but its outline or association or connection with the SAGE system.

Mr. PYLE. I will ask Mr. Tippets, after I have concluded my statement, to talk to that point.

Mr. HARRIS. You may recall that Congressman McCormack, the majority leader, has expressed a great deal of interest in the SAGE system and has had a number of items about it put in the Congressional Record. He has discussed this with me. He thinks there are great possibilities in this field.

Mr. PYLE. There is no question that there are great possibilities and we intend to pursue them to the ultimate. There are certain complications and it is the manner, in which we resolve these complications that I will ask Mr. Tippets to explain if further detail is desired afterward.

In the terminal area, we use airport surveillance radar, of shorter range. The plan calls for 44 additional ASR's, and 45 have been provided in prior years.

This, Mr. Hale, is the 31 to which you referred earlier.

The Defense Department is installing 20 similar equipments which will be operated by CAA. Present ASR's can see up to 12,000 feet, but the height capability will be increased.

Without radar, the traffic controller must keep aircraft separated from each other by comparatively large amounts of airspace. With radar, the traffic capacity can be increased drastically, on the order of 4-to-1.

The space-saving features of radar can be effective only when the radar controller is in immediate voice contact with the pilot. We plan to complete, in fiscal year 1957, our program for providing direct controller-to-pilot communications, using remotely located radio stations connected to our air route traffic control centers by landlines or radio circuits.

The present communications are too slow, due to the necessity of relaying messages either through company radio stations or our own communicators at intermediate points between centers.

The requirements for short-range navigational facilities are based on air traffic studies made by CAA. These have been used by the Air Navigation Development Board to determine the route structure and number of facilities required to handle anticipated traffic by 1965. The estimates were based on the use of a polar coordinate system without prejudice to any specific type (that is, VOR/DME or Tacan), and the recent ACC recommendation paves the way for integrating the 2 systems into 1 system which will be known as Vortac.

The system is designed to provide track guidance at lower altitudes than is now possible, multiple tracks in congested areas, and additional routes. A polar coordinate system is necessary because a pilot must, in the future traffic densities, know that he is not only on the proper track but where he is on that track.

A very pressing requirement of the military, and presently of civil jet aircraft operators, is the control of all aircraft moving under instrument flight rules at altitudes above 15,000 feet. The 1957 appropriation provides the direct communications necessary for such con-

trol, and the floor of control will be progressively lowered as communications, radar, and trained personnel become available.

I might mention in that connection, Mr. Chairman, that we hope by April 1957 to have this area control concept which we are talking about here. In other words, an aircraft at any point above the United States will be afforded area control above 24,000 feet by April 1 of next year and that, we hope, and I do not think we are too optimistic, by January 1 of 1958 we will be able to lower that floor to 15,000 feet.

Mr. HARRIS. What do you mean by area control?

Mr. PYLE. In other words, sir, it will not be necessary for an aircraft to fly on an airway to be assured of instrument-flight rule protection. He can be anywhere in the airspace above the United States provided he is above the altitude to which I refer. He will be assured of instrument flight rule protection; in other words, uncontrolled airspace will be a thing of the past above 24,000 feet after April 1 of next year and above 15,000 feet after January 1 of 1958.

Mr. HARRIS. Does that contemplate doing away with established airways ultimately?

Mr. PYLE. No, sir. A pilot can elect to fly whatever he wants under those conditions. Certainly they will continue to fly the airways. The point is that our system will have the capability of affording control at any point in the airspace above the United States at the higher altitudes.

Mr. DOLLIVER. Do you contemplate that will eliminate the visual flight rules?

Mr. PYLE. No, sir.

Mr. DOLLIVER. That will be optional with the pilot, as it is now, whether he flies instrument or visual?

Mr. PYLE. Yes, sir.

Mr. MACK. Are you saying that by April of next year you will have complete coverage of the entire country above 24,000 feet by radar?

Mr. PYLE. Not necessarily, but there will be sufficient navigational aids which will enable the pilot to know his position and he will be able to work with the flight controller just as though he were flying the airways today.

Mr. MACK. Then there will be some areas where he will not be covered?

Mr. PYLE. They will be covered so he can pinpoint his position. He and the controller will know—I was going to say the Grand Canyon area, but we will actually have an airway designated by next spring there. He will be able to say that he is over Painted Desert, but the specific location of the Painted Desert also when he is above 24,000 feet by April of next year. So that, in effect, he will be flying as if he were on airways but the airway requirement is no longer necessary for him. We will be able to give him control.

Mr. MACK. Is that because of your radar aids?

Mr. PYLE. Not necessarily radar. There are three problems, navigational aids, additional communications, and radar. All three of them add up to this combination.

Mr. MACK. It might be DME, is that what you are saying?

Mr. PYLE. Well, we are not basing our plan on that, sir, because we are phasing into the Vortac system so that I do not think—well, the

answer to that one is no, it will not be DME because there are not sufficient aircraft equipped.

Mr. HARRIS. You are going to retire DME stations, are you not?

Mr. PYLE. DME will be phased out as the new system comes in. The point is that there would not be a sufficient number of DME-equipped aircraft to make it a piece of useful information insofar as aircraft is concerned. If you depend on DME and the aircraft is not equipped, then we cannot control them.

Mr. MACK. Are you in a position to state what you are going to do to accomplish this by April 1?

Mr. PYLE. Yes, sir; we will have it above 24,000 feet; area control will be in operation based on the 3 factors I mentioned, additional navigation aids, additional communications stations and additional radar, and all 3 of those play a part in it. I do not know whether I have answered your question.

Mr. MACK. I am not really sure I understand how you are going to accomplish area control.

Mr. PYLE. We provide the pilot the ability to pinpoint his position geographically if he is flying a direct route instead of an airway route.

Mr. MACK. You are not guaranteeing him that there will not be any other traffic.

Mr. PYLE. No, sir.

Mr. MACK. Or a midair collision.

Mr. PYLE. If there are two planes flying IFR, we can provide the separation, but if there is a VFR operator up there, we cannot take care of him, just as on the airways today; we have the problem, as you know, of the VFR operator on the airways.

Mr. MACK. I will not take any more time right now.

Mr. HARRIS. You may proceed.

Mr. PYLE. The amount of bad weather flying has increased to the point where airport runway light must be augmented by lighting in the approach area. Obsolete and short systems will be replaced with standard approach lighting at 19 locations in 1957, and future plans will provide lighting at all ILS locations.

Secondary radar, the ATC radar beacon, to improve the functioning of primary radar is requested for 18 locations in 1957; 134 places were in the original plan.

The cost of maintaining and operating the improved and expanded system will be about $118 million in 1957, but will increase in future years, as new facilities are manufactured, installed, and placed in operation.

Mr. MACK. Could I interrupt to ask what you mean by secondary radar?

Mr. PYLE. That is the radar beacon, Mr. Mack, and that is an electronic device which is on the airplane and which is triggered by a ground component and it emits a signal. It is comparable in its function and mission to the IFF that will show up on a radarscope. There are two reasons why this is important.

First, it will, to a great extent, reinforce the radar signal in terms of distance away from the radar site so that we can see a plane farther out.

Second, it will enable us to be sure of picking up jets because of the clean nature aerodynamically and the fact that they do not have the

propeller disk to reflect the radar signal and are much harder to see on a radar.

Mr. MACK. That will also help your radarscope in the planes, that they are putting in the plane now; is that not correct?

Mr. PYLE. That is perhaps a fourth function that it will assist with.

Mr. MACK. Mostly, this is for ground radar?

Mr. PYLE. Ground radar primarily. It is believed, and this, someone who is better equipped electronically than I am can answer; however, I do not think that it will be too significant in the showing up in the radarscope.

I do not know how the frequencies work out. The Air Transport Association is working on another device which holds much greater promise than does this particular situation.

The third point, of course, is that in certain atmospheric conditions the radar has difficulty seeing through snow or rain or hail. The beacon will enable that signal to come right straight through from the airplane. Again it reinforces the signal.

Mr. MACK. It could be picked up in thunderstorms?

Mr. PYLE. Very definitely.

The plan notes the rapidly increasing amount of air traffic, the increased speeds of jet aircraft, and the slow-moving helicopters. The amount of traffic in being is already somewhat in excess of our estimates, so the few figures I will use can be considered conservative, however large they may seem.

The several indexes of air traffic activity all tell the same story of consistent and rapid increase in recent years. Airline passengers have been increasing at the rate of 12 percent a year, which is equivalent to doubling the number every 6 years.

The businessmen of the country are using their own or company aircraft to perform an ever-increasing amount of travel in planes which are equipped to fly the airways in good weather and bad, the same as the airline fleet.

The amount of military traffic under CAA control has reached the point where the CAA traffic controllers' workload is nearly double that which would be due to civil traffic alone.

The position reports we must have to control instrument flight rule traffic have been increasing at 12 percent a year, as are the number of instrument approaches to airports, but both increased even more sharply this last year. These facts all confirm what aviation people have been saying, with the result that we could no longer postpone requesting funds for making a very significant increase in the capacity of our airway system.

All equipment in the plan is capable of being used in connection with automatic devices now under development to ease the manual and mental load on traffic controllers and pilots; the investment will not soon be outmoded due to the techniques of automation.

The cost of the new equipment proposed, plus the added cost of maintenance and operation, is large when compared with previous CAA operations. But when compared with the amounts invested in civil and military aircraft which use the system, the money to be spent on airports and airways appears trivial.

The plan is open ended; it will be revised annually to reflect changes in emphasis, availability of new equipments and techniques, and expanded as necessary to meet the demands of changing traffic densities and new types of aircraft.

The ability to procure radar meeting suitable new specifications, to further procure long-range radar and other electronic devices, as well as increased public awareness of the urgency of air traffic needs, resulted in the President's request to increase the $40 million already appropriated for 1957 so as to permit financing of the proposed capital improvements in a period of 3 years instead of 5.

The Congress approved an additional $35 million for 1957 and this will enable CAA to meet the needs of tomorrow sooner than would have been possible otherwise, and with a greater margin of safety. The time required for the manufacture of new equipment and the training of new people in the operation of highly complex equipment and techniques necessitates funding well in advance of the required dates of implementation. CAA is at war, so to speak, with tomorrow's traffic demands, and is preparing accordingly.

The plan was reviewed in the Air Coordinating Committee, and it is the ACC's view that the plan represents the minimum effort which must be made at this time if we are to cope successfully with the air traffic problem of the years immediately ahead.

The CAA will be required to expand its staff of engineers in Washington, and in the field, and we also plan to contract with outside engineering firms for portions of the work which lend themselves to this type of operation.

The following tabulation shows the progressive implementation originally contemplated for various types of facilities during the period 1957–61.

The supplemental appropriation makes some of these figures obsolete, and the original figures are used for illustrative purposes only. Revised proposals for the 4 years 1958 through 1961, plus a program for 1962, are now being prepared for the forthcoming annual revision of the Federal airway plan.

I could read these, Mr. Chairman, but perhaps I should not take your time. Perhaps I could explain any questions with respect to this that the committee might have.

Mr. HARRIS. This is the 5-year plan?

Mr. PYLE. Yes, sir; this is the 5-year plan as originally conceived.

Mr. HARRIS. You do not have the 3-year plan showing how you decided?

Mr. PYLE. The 3-year plan is substantially the same here, with the one exception of an additional capital investment of some $22 million to provide this 15,000-foot area control concept that I was talking about. There are additional communication and navigation facilities involved there, primarily communication.

Are there any questions I might answer for the committee in connection with this equipment?

Mr. HARRIS. Would you rather revise this table in accordance with your 3-year plan?

Mr. PYLE. We will furnish you with the additions in that connection, Mr. Chairman.

Mr. HARRIS. Do that and let it go in the record with this, then.

(The table referred to follows:)

New equipment in Federal airway plan

Facility or services	Through 1956	Additional by fiscal year—					5-year total	5-year total cost
		1957	1958	1959	1960	1961		
ATC towers	186	17 (17)	5 (12)	5 (18)	5	8	40	$3,354,000
Air traffic coordinating equipment								25,000,000
Airport surveillance radar	45	2 (2)	15 (23)	15 (25)	12		44	17,061,000
Airport surface detection equipment				10		10	20	5,000,000
			(20)					
Approach lighting:								
Lead-in systems	4	9 (—)	40 (—)	40 (—)	10 (—)	7 (—)	106	5,822,00
Sequenced flashing lights	2	— (—)	10 (16)	12 (21)	5	5	32	1,280,000
Standard approach lights	19	18 (19)	10 (64)	10 (68)	11		49	4,758,000
Direction-finding equipment	60			50	50		100	750,000
High altitude control of airspace								1,580,000 (23,375,000)
ILS/DME	170		15 (26)	13 (34)	13		28	4,529,000
Long-range radar (including military)	4	18 (26)	22 (21)	29 (22)			69	39,536,000
Omniranges/DME	498	76 (82)	79 (148)	76 (151)	76	76	383	44,828,000
Precision approach radar	22				20		20	6,000,000
Secondary radar		18 (18)	60 (22)	44 (81)	12 (57)		134	14,771,000
Modernization of facilities								72,423,000
Total								246,192,000

NOTES.—(1) The above quantities are the ones in the original plan which was based on a $40 million appropriation in 1957.
(2) The figures shown in parentheses show the tentative revised quantities applicable under a schedule for financing some items over a 3-year period instead of the original 5-year period.

Mr. PYLE. I might just mention a couple of items here that might be of interest to the committee.

The air traffic coordinating equipment is an attempt to solve the problem of display of moving traffic in the airway system or over the United States by some electronic means. We will have to be quite frank; we have not yet come up with the right answer to this one. This is a highly complex problem.

This is the same problem with which SAGE is faced, and that is where we are getting this cooperation, from the SAGE people, and I think we will come up with the right answer but I cannot overemphasize the complexity of this problem. It is almost superhuman to come up with the right answer.

The SAGE people have spent many millions of dollars and are still far from coming up with the right answer, and our problem is more complex, if anything, than theirs.

The fourth item is one I wanted to speak of, airport surface detection equipment. This is a special type of radar which enables us to see aircraft or vehicles moving on the surface of the airport. We feel, as we get to the lower and lower altitudes, the pilot will be unable to land and get himself back to the ramp area because of the restricted visibility. This will provide guidance for our controllers, enable our controllers to guide the aircraft back to the ramp.

I do not believe there are any other items, unless you have some questions.

Mr. HARRIS. I notice you have omniranges/DME, 498?

Mr. PYLE. Those are additional VOR stations and the DME will be that distance measuring equipment about which the recent decision has come out. Nevertheless, it will be clear channel DME, to be specific.

Mr. HARRIS. Does that mean you are going to continue them? I thought you were going to phase them out.

Mr. PYLE. No, sir. This will be the distance measurement under the new concept.

Our present DME is so-called pulse-multiplex-DME. The new DME will be clear channel.

Mr. HARRIS. It is part of the VORTAC?

Mr. PYLE. Part of VORTAC; yes, sir.

Mr. HARRIS. Will it mean a number of additional stations?

Mr. PYLE. No; I don't believe so.

Mr. HARRIS. You say ILS/DME. What is the difference?

Mr. PYLE. That is a distance measuring transmitter or device that will be made part of the ILS system, so that a pilot, when on final approach, will know at all times how far he is from the end of the runway.

This is an additional piece of information which we feel is of real value to him.

Mr. HARRIS. That is not part of the VORTAC?

Mr. PYLE. Yes, sir; that will be the same system, part of the VORTAC.

In other words, any DME installation that is mentioned here will be that DME which is clear channel and part of the VORTAC system.

Mr. HARRIS. I believe that is all.

Mr. PYLE. We now come to the third item of the committee's request: "The relationship between the CAA and the CAB in promulgating and enforcing the regulations."

In the field of aviation safety, the Civil Aeronautics Administration and the Civil Aeronautics Board share responsibility.

When the Congress approved the separation of the old Civil Aeronautics Authority into the present organization, it divided the aviation safety responsibilities between the Board, on the one hand, and the CAA on the other.

Generally speaking, under this separation of responsibility, the Civil Aeronautics Board is charged with the duty of issuing the safety rules and regulations, while the Civil Aeronautics Administration is charged with the duty of administering and enforcing these regulations.

As an example, the CAB prescribes the regulations governing the manufacturing processes of aircraft and their components having to do with design, structural integrity, performance, and final production airworthiness.

In addition, the CAB issues regulations governing the operation of aircraft on an airways system and prescribes further regulations which specify the minimum requirements that an individual must meet to be issued a pilot certificate, a mechanic certificate and in fact, all other classes of airman certificates.

The Office of Aviation Safety employs 852 highly skilled technicians made up of engineers, test pilots, factory inspectors, air carrier inspectors in the flight, the maintenance and the electronics and radio

specialties, general aviation inspectors in the flight and maintenance specialties, and doctors trained in aviation medicine and related human requirements.

These technicians have been placed at strategic locations in 120 Aviation Safety district offices within the United States, Alaska, and Hawaii, and 6 regional and the Washington headquarters offices.

In addition, our responsibility for international United States-flag carriers is carried on in 5 international district offices within the United States, and also in 11 foreign district offices supervised by the International Region Headquarters Office.

These are the engineers, test pilots, and inspectors, whose job it is to enforce the regulations and to counsel, advise and work with all segments of industry to achieve the highest standards of safety practicable.

Our technicians, engineers, and inspectors are in daily contact with air carriers and with the flying public throughout the country. Their duties require an intimate knowledge of the problems being met by those operating aircraft and with the manner in which the various segments of the industry are solving, or attempting to solve, those problems.

The information obtained by our field staff is furnished to our regional offices, and through them to our headquarters offices, with the result that the personnel of the Office of Aviation Safety, all along the line, are kept in constant touch with the chifting pattern of safety problems in the aviation industry.

This intimate, almost family contact, with the problems of aviation is made necessary by the very nature of the industry, which is expanding both in size and complexity on almost a daily basis. Becauses of the almost explosive growth and development nature of the industry it has been a struggle for Government to maintain a proper regulatory balance in its activities.

We, frankly, in the CAA, have felt that because of our intimate contact with all phases of the problem the Government's regulatory function might be more effectively conducted if there was a delegation from the CAB to the CAA of a portion of its rulemaking authority.

To this end, I have just concluded discussions with the Chairman of the CAB, and it has been agreed between us that a study of this problem will be made under the direction of myself and the Chairman of the Board. We intend to study the existing regulatory system in order to determine whether it might be desirable for the CAB to delegate to the CAA the safety rulemaking authority in those areas in which the CAA, by virtue of its widespread and highly skilled technical staff, has the most intimate knowledge of safety problems.

Because of the approach which both the Chairman of the Board and myself have taken with this problem, I feel certain that within the very near future we will have arrived at a solution which will improve the Government's ability to satisfy the regulatory needs of aviation.

The CAA and the CAB share responsibility in still another area; namely, the enforcement of the civil air regulations. If one of our inspectors finds that a particular individual, air carrier, manufacturer, or other person, is not complying with the safety regulations and requirements, it is his responsibility to initiate appropriate enforcement action.

A violation of the safety regulations may be the occasion for the CAA's filing a complaint with the CAB, requesting a suspension or revocation of the airman certificate, or operating certificate of the violator.

The Board will then schedule a hearing before one of its examiners, and both the CAA and the violator are given an opportunity to present their case, and after consideration of the record thus made, the Board determines whether suspension or revocation action is required in the interest of the public.

As an alternative to this type of action, the CAA under the Civil Aeronautics Act, is empowered to assess civil penalties provided by that act. These are in essence monetary fines, and may be disposed of either by compromise between the Administrator and the violator, or, if such compromise cannot be reached, the case is turned over to the appropriate district attorney for collection in the United States district court.

In order to protect the public in emergency situations, the Administrator may also make an immediate emergency suspension of a violator's airman or operating certificate, if this is required. Having done so, however, the Administrator is required to file a complaint immediately with the Board so that the violator may be provided a hearing to determine the appropriateness of a further suspension or revocation of his certificate.

In this area, as well as in the regulatory area, the Government is faced with a rather delicate task of regulating and enforcing an industry as healthy and vital as the aviation industry.

On the one hand, if room is to be left for industry initiative, the regulatory structure must be sufficiently flexible to accommodate growth.

On the other hand, the human lives involved must remain the principal concern of both industry and Government in devising and administering safety regulations. This has taken, and will continue to require, cooperation by and between the two Government agencies involved and the industry.

This, I believe, will be accomplished.

I should like to comment on the last point on which the committee desires information, the CAA and military use of like facilities.

The CAA considers it a matter of urgent operational and economic necessity that whenever possible shared use be made of air navigation and air-traffic-control facilities.

The CAA presently operates 5 radar approach control facilities, established by the military, and active plans are in the making to operate 15 more in the next several months.

We are operating 1,631 channels of ultra high frequency equipments purchased and installed at military expense.

I might explain that those are transmitters and receivers over which the pilots communicate directly with traffic-control towers, or communications stations and so forth.

The military, very credibly, has gone to a higher frequency band to relieve the congestion in the very high frequency radio band and thus they get better communications and it decreases to some extent the load on the very high frequency band, and that is the reference that is made here.

Thirty military direction finders are now operated by CAA that were purchased and installed by the military in CAA facilities.

In the field of long-range (en route) radar, CAA is ready to commission two shared-use facilities (Miami and Olathe) and has active plans to use additional Air Defense Command radars in 1957; and it will depend on our research with the Air Defense Command whether it will be 2 or go to the maximum of 7.

This is the point to which I made reference earlier.

Long-range military type radars are currently operated by CAA at New York, Chicago, and Washington.

In this regard the CAA and USAF have an intensive program under way to study on a nationwide scale all possible usages that can be made by CAA of military radar, and vice versa.

Furthermore, we have a permanent staff in the Boston area to study and evaluate the possible use of the Sage system.

We plan to pursue shared use possibilities and effect such usage wherever possible and advisable.

This concludes my formal presentation on the items on which the committee has requested information.

However, I shall be delighted to answer all questions to the best of my ability.

Mr. HARRIS. Thank you very much, Mr. Pyle, for a very fine and enlightening statement.

I cannot express my delight in seeing the action that is being taken. We are getting somewhere.

Mr. PYLE. We thank you, sir.

Mr. HARRIS. I am sure it will be encouraging to the people throughout the industry, as well as the flying public, to know that this action is being taken all along the field to increase the efficiency and safety of air traffic.

I want to congratulate the men in both the Civil Aeronautics Board and their staff, and your organization and associates and staff for, I suppose advisedly, I should say, finally getting together, working together, and coming to a common decision on these matters that are so important to the industry.

Certainly I can see the difference in attitude myself, even from that which existed last summer, and I think in all frankness it should be a credit to everyone along the line. It cannot result in anything except enormous benefits to the public.

You did not describe—or I suppose Mr. Tippets or someone else would like to do that—our airways in your statement.

Are you going to do that for us?

Mr. PYLE. Frankly, I think Mr. Tippets could give you a better explantion, very much better, Mr. Chairman, than I. That is his field.

Mr. HARRIS. Of course, that was not included, I believe, in the letter that was sent down, but later it did develop it was important and I think we would like to have an explanation as well as a description of the airways, because we understand that very few, if any, have been added to our system in many, many years.

Mr. PYLE. Shall I have Mr. Tippets, then, give you a description?

Mr. HARRIS. I suppose, first, we better see if anyone has any questions of you on the statement that you just presented.

Mr. MACK. Yes, I have.

Mr. HARRIS. Mr. Mack.

Mr. MACK. I am sorry, I did not hear your testimony concerning the DME stations. I understand you have 234 of them presently; is that correct?

Mr. PYLE. I believe it is 231, sir; 230 or thereabouts.

Mr. MACK. And those are in operation today?

Mr. PYLE. Yes, sir; they are. Those are commissioned facilities.

Mr. MACK. They have not been used extensively, of course?

Mr. PYLE. No.

Mr. MACK. Because of the lack of equipment in the airplanes?

Mr. PYLE. That is correct, sir.

Mr. MACK. You are going to decommission those stations; is that correct?

Mr. PYLE. They will be continued in operation until the new system is in commission and operating.

In other words, the problem, as I see it, is somewhat like this: The stations will be continued at as many locations as we can, provided there does not arise a conflict between the new clear-channel DME, which is in the same frequency band, and, of course, that has been the big problem, as I think you are aware, so that as long as they are not in conflict they will be continued in operation, as long as we can conveniently, with probably an ultimate target of phasing out somewhere in the neighborhood of 1960.

Therefore, I would say that there will be probably approximately 4 more years' operation of the DME, gradually phasing out in favor of the new system which will be coming in.

Mr. MACK. And you think that can be done gradually in most cases?

Mr. PYLE. Yes, sir.

Mr. MACK. Usually it would be operated until the new system was in operation?

Mr. PYLE. This is one which perhaps if you want you might ask Mr. Tippets about, too, but the problem becomes one of available frequencies and you get into the pairing of a VOR frequency with a certain DME frequency—clear channel, I am speaking of—where that falls into that part of the spectrum in which the civil DME, let's say, for purposes of identification, is operating, then the civil DME must give way to the clear channel DME.

It is very difficult until you start plotting on the map where these things are going to be and the pairings that are going to be used to determine where that situation comes.

Mr. MACK. You can continue them in operation until the new station is in operation?

Mr. PYLE. I would hope that that would be the way we would do it.

Mr. MACK. Except in rare instances where you have a conflict of frequency?

Mr. PYLE. That is our objective in putting the new system in operation.

Mr. MACK. The systems will be phased out by 1960, and the DME stations—what is approximately the cost of that? How much have we involved in that field?

Mr. PYLE. Could I refer to my expert on that one?

Mr. TIPPETS. The Federal Government has approximately $10 million invested in ground DME's.

Mr. HALE. Approximately how much?

Mr. TIPPETS. Approximately $10 million in ground DME's.

Mr. MACK. That would be for your 231 stations?

Mr. PYLE. No, sir. We have funded for a total of 454 and 231 is all that was ever commissioned.

Mr. MACK. Does the $10 million include the ones that were not commissioned and the ones that have been commissioned?

Mr. TIPPETS. Yes, sir.

Mr. MACK. You have certain DME equipment that you say is in storage, or has not been installed. Some have partially been installed, perhaps?

Mr. TIPPETS. Mr. Mack; yes, sir. Mr. Rothschild intends to appear tomorrow and explain this subject in its full detail, as Mr. Harris has requested.

The situation was this: that we were in the process of installing these 454 when it became very evident, and properly so, that in the best interests of the total navigation system something be done to bring this thing to a decision, so about 2 or 2½ years ago we had reached the point of having 231 installed and operating, and funds were made available by the Congress for their operation.

The balance of the 454 were in different stages of installation, so we froze those installations pending an outcome of a decision which has long been in Congress, but finally we have an agreement now on a new common system, or the Vortac, so these equipments were never actually placed in operation.

There are approximately 100 of them that are installed and could be turned on by a flip of the switch, so called.

The balance, though, are in the buildings, but not connected or ready for operation.

Mr. MACK. There is another question: Is there any possibility of recovering any of the cost?

Mr. TIPPETS. We are still exploring the possibilities of some use of these by a conversion. This is something, though, that I can't say positively that it can or cannot be done.

By conversion, I mean to make them compatible with the Tacan-type distance information; it is under consideration, but technically may not be desirable to do so.

However, we are going to explore that to the fullest before we say no.

Mr. MACK. Presently you would have to write off the full $10 million?

Mr. TIPPETS. Yes, sir.

Mr. MACK. I have no further questions, Mr. Chairman.

Mr. HARRIS. Mr. Hale.

Mr. HALE. Yes, sir.

I want to compliment you on the statement, Mr. Pyle, which is deeply interesting and on the whole quite reassuring.

On this question of radar, I am familiar with radar on ships where you are dealing with a two-dimensional situation. When you have these air surveillance radars can you tell from the radar how high the plane is?

Mr. PYLE. The answer to that is we cannot, sir, from the actual signal that is displayed on the radar scope. We can tell the distance the aircraft is from the station and its direction from the station.

However, we cannot tell his altitude.

Mr. HALE. In other words, your actual situation is 3 dimensional and your radar is 2 dimensional?

Mr. PYLE. That is correct. We do maintain through communications with the pilot a knowledge of his altitude by giving him instructions to proceed in certain directions to maintain his altitude.

Mr. HALE. In other words, you have to get the altitude by direct contact?

Mr. PYLE. With the pilot. That, in essence, is correct.

I will say this: there are under development by the military radars which will display a three dimensional type of presentation. However, the problem is a complex one and it is some years ahead of us as yet. We have to use what is now presently available and put in that that is in being.

Mr. HALE. You look forward to a time when there will be such a thing?

Mr. PYLE. I would certainly hope so, because it would eliminate one further communications load on our communications network if we knew exactly what his altitude was.

There is one other possibility that ties in with the safety beacon and that is that beacon might be so coded that it would at all times emit a message stating that the airplane is at such and such an altitude, would show up on the radar scope, so the controller would automatically know, that TWA so and so was at 19,000 feet, or whatever it was.

This is a further point that we are looking into. This looks more immenent that the other.

Mr. HALE. You look at your radar scope and within a radius of 30 miles you see, we will say, 20 different planes. You can tell from the screen in what direction they are proceeding.

Mr. PYLE. Yes, sir.

Mr. HALE. But you cannot estimate from the screen the possibilities of collision unless you have communication with the pilots? You do not know at what altitudes the planes are flying.

Mr. PYLE. The controller follows his aircraft and if necessary, if he isn't sure, he makes that aircraft make a turn so that he knows I am following such and such an airline trip, or it may be a private plane or military aircraft, whatever it may be.

Then he at all times keeps him under control. If he sees two blips going together—in other words, as if they were colliding—he knows there is an altitude separation because he knows the altitude of each one.

He may follow them by inscribing on a little plastic disk he places right over this signal the actual altitude of the aircraft.

There are various techniques which we use, but in every instance where there is a situation which looks like an imminent collision, we watch him to be sure that there is proper altitude separation.

Mr. HALE. The use of radar in the planes is entirely for the future, is it not?

Mr. PYLE. Right now we have radars and have very fine ones in the planes, but their function and mission is to look ahead, particularly ahead, and pick out disturbance areas, thunderstorms, things that may put possible strain on the structure of the aircraft.

In other words, no one wants to fly through a thunderstorm, so that radar is at that frequency band which will pick up the accumulation of moisture and so forth.

The pilot then sees it and he steers around it.

However, it is not in the proper frequency band to pick up aircraft.

There are other technical problems that get involved there.

Mr. HALE. There again you would have this three-dimensional problem; would you not?

Mr. PYLE. Yes, sir.

Mr. HALE. Unless you have a three-dimensional radar the pilot who sees on a radar screen a plane right in front of him does not know whether the plane is on the same altitude, or higher, or lower.

Mr. PYLE. That is essentially correct, Mr. Hale.

Mr. HALE. So that he cannot appraise the degree of danger?

Mr. PYLE. The Air Transport Association has worked up a device, and they were kind enough to give us all the information on it, that looks like it has much greater potential in solving this problem than does the radar.

However, it is still in development status at the present time.

Mr. HALE. We have under construction in my district one of these so-called SAGE installations. Will you explain that? Is that in connection with civil aircraft movement?

Mr. PYLE. The SAGE completion is all part of the Air Defense Command and I would hardly feel qualified to describe it in very great detail.

In the first place, I don't know too much about it.

Mr. HALE. The SAGE is mostly military?

Mr. PYLE. Yes, sir. Its primary mission is for defense of the United States and to identify aircraft, dispatch interceptors, or the proper weapon to——

Mr. HALE. It is a watching device.

Mr. PYLE. It is a watching and actual intercept function. There is a close interrelationship between traffic control, our mission, and the Air Defense Command, because we have to assist the Air Defense Command in identifying those aircraft that are friendly, about which we know, whose movements we know, so that there is a close interrelationship, and this is the area in which I feel there is great promise for marrying our functions and SAGE's.

Mr. HALE. Thank you very much.

Mr. HARRIS. Mr. Rogers.

Mr. ROGERS. Mr. Pyle, I presume that it is being contemplated now that we are nearing the saturation point insofar as airspace is concerned around the cities like Washington, Chicago, Philadelphia, and New York, and that that is going to bring about the need of additional airports to handle the traffic.

That simply means that we are going to have to travel farther on land or on the surface after we land in the aircraft than we have in the past; does it not?

Mr. PYLE. I would say all things being equal, it does, Mr. Rogers.

Mr. ROGERS. In your plan about how far apart are you thinking of putting those airports for safety purposes?

Mr. PYLE. This is a difficult question to answer, but I don't think there is any specific criteria that you can come up with as to what is the desirable distance to separate airports.

If you lay out your airports with all, let's say, the instrument runways in a parallel direction, you can within certain limits get them much closer together than if their paths intersect, for obvious reasons.

In other words, all the traffic flows in one direction.

Now, the New York area is a fairly good example. Those airports are approximately 8 to 12 miles apart. We do have problems up there, but they are not insoluble.

I think the proper answer is where practicable to separate them as far apart and yet maintain the convenience for the community, and I think each area will have to be decided, or each selection of sites will have to be decided, on its own merits.

I am afraid I can't give you a categoric answer.

Mr. ROGERS. The thing I am thinking about is this: The general pattern over an airport. About how far does that extend out from the airport, in miles, we will say, or you would have to extend it how far in order to create a safe area?

Mr. PYLE. For the actual final approach functions, probably 5 to 10 miles. However, as in the case of New York, for instance, we have to have holding stacks. That all becomes part of the operation of that airport, so that depends on the location of your navigation facilities to a certain extent, and on what kind of community do you have underneath there.

Is it going to prove a nuisance if we have 8 or 10 airplanes running around upstairs?

So that again is a little difficult to answer, but your pattern may be up to 20 miles in certain instances.

I think we are going to find that with the jet we are going to have to have a little bit more area. That is why we are going out to Boeing to fly the 707 and find out at first hand what is the problem we are up against. We want to be sure.

Mr. ROGERS. Say you had 3 or 4 airports in Washington. Could that all the handled by one traffic-control tower?

Mr. PYLE. No, sir. Each one would have its own traffic-control tower, its own approach-control facility, just as we have 3 of them in the New York area—1 at Newark, 1 at LaGuardia, and 1 at Idlewild.

The only 2 airports there that are handled by 1 facility are Teterboro and Newark. They are all handled off Newark.

There is a tower at Teterboro, but the approach-control facility, I believe, is handled at Newark.

In each instance there would be, then, an approach-control facility. We feel that the possible answer for the interrelationship or the close control is not voice, but closed-circuit TV, and we are putting that in New York to provide the controller with an even more rapid means of intercommunication and seeing what the other fellow has to worry about.

This, in turn, provides a most convenient means of interrelationship between the long-range radar and the approach-control radar, so that

there is a continuous flow of information available to the controller at all times.

Mr. ROGERS. Mr. Pyle, I have two other questions. One of them has to do with the situation out at Grand Canyon.

If the man who had IFR clearance left the airways, would that IFR clearance on a controlled area entitle him to fly through a cloud in an uncontrolled area?

Mr. PYLE. Technically, from the rule standpoint, the answer is "yes," provided he flies at the quadrantal altitude that Mr. Bakke described; in this particular instance 19,000 feet or 21,000 feet.

When he is on airways, of course, he can only fly at his assigned altitude.

Mr. ROGERS. The other question is concerning this table on page 12. I think it is very obvious that air travel has increased tremendously, these present air terminals remind you of railroad depots during World War II, as far as customers are concerned. You can't get into them, and you cannot get out of them. Business has certainly picked up.

I assume from this table, the way it is drawn up, that this entire projection is to be paid for by the United States Government.

Mr. PYLE. That is correct. This is part of the discharge of our responsibility for the control of air traffic, sir.

Mr. ROGERS. It may not be within your field, or you may not have anything to do with it, and you may not have given any thought to it, but has any thought been given to the proposition of the commercial airlines paying a proportionate part of this cost, rather than saddling the taxpayer with all of it.

Mr. PYLE. This problem has been discussed for some time, Mr. Rogers. It is the user charge discussion.

Mr. ROGERS. Of the airport?

Mr. PYLE. No; of the airways themselves.

This, however, presents a great many problems. How do we do it equitably? Is it proper for us to pass on this charge?

All I can say is that it is still very much under study, very much in the minds of a lot of people.

Mr. ROGERS. As to the landing fees or the fees at airport, do those fees all go to the installation itself?

Mr. PYLE. That is correct. They go to the municipality or county or State government, whatever it may be, the governmental organization that operates that airport.

We operate no airports except two in Alaska.

Mr. ROGERS. I would presume there has been thought given to creating the fee or charge, tacking it onto the airport fee, and having it remitted to the United States or to the CAA.

Mr. PYLE. The problem is a little more complex than that, Mr. Rogers, in that respect. You have an airplane that is flying on the airways. He may not land at any one of those airports. He may fly off his cow pasture.

As a result, some device must be worked out if we all think this is proper to distribute the burden of these facilities over the users of the airspace; that is, the civil users of the airspace.

There have been various thoughts given. Addition to the gasoline taxes is one that has some merit to it.

Mr. ROGERS. There has been so much talk through the years about the subsidies that the airlines got that I was just wondering if we

would not probably be faced with the proposition here within a few years, if they go to showing tremendous profits, of people wanting to know why all this money is being spent by the Government without some contribution back from the commercial airlines. I guess my question may be a little in advance.

Mr. PYLE. I don't think it is in advance, Mr. Rogers, because it is actually under consideration now.

However, there is one point that I think we all ought to keep in mind, and that is that our airways system performs a very valuable contribution to national defense.

In fact, in terms of instrument-flight operations, the military absorb approximately better than 40 percent in terms of flight postings, which shows that under instrument-flight conditions they are taking about 40 percent of the capacity of the system.

As a result, the Government is paying for the service it requires.

Mr. ROGERS. Thank you, sir.

That is all, Mr. Chairman.

Mr. HARRIS. Will the gentleman yield?

Mr. ROGERS. Yes.

Mr. HARRIS. Is there consideration being given to the competitive advantage it might have over other modes or types of transportation?

Mr. PYLE. I don't believe I am in a position to answer. Perhaps I don't understand your question, Mr. Chairman.

Mr. HARRIS. You can understand that the more service the Government provides for a particular or given mode of transportation, the greater advantage that mode of transportation will have over another mode.

As an example, where there is Government assistance or help—in other words, the buses on the highways, the highways provide for the buses—they are in a more favorable position with reference to their fares and rates competitively speaking, than they would be when Government does not furnish the roads and facilities and so forth. That is what I had in mind.

Mr. PYLE. That certainly enters into it, Mr. Chairman.

Mr. HARRIS. Mr. Dolliver.

Mr. DOLLIVER. I join in the compliments that have been given you, Mr. Pyle, about your statement. It has been very fine.

Mr. PYLE. Thank you, sir.

Mr. DOLLIVER. I am wanting to ask you some questions, along the same line, that I questioned Mr. Bakke yesterday with respect to rulemaking. You say the matter is now under discussion between you and Chairman Durfees, of the Civil Aeronautics Board.

Is it your thought that the rulemaking functions ought to be further subdivided than it already is as between the Civil Aeronautics Administrator and the Civil Aeronautics Board?

Mr. PYLE. I think the answer, sir, can be best put in this way, Mr. Dolliver: We feel that there may be certain areas in which we in the Civil Aeronautics Administration are closer to the problem, due to the vast extent of our organization and the number of skilled people we have, than might be the Board.

However, we feel that this is something we are going to have to work out cooperatively and I think I am prejudging the case if I answer specifically this area, that area, and so forth.

We would like to be sure. The one thing we want to do is come up with the right answer.

Mr. DOLLIVER. Mr. Bakke pointed out in his testimony yesterday certain areas where the rulemaking power had been delegated by the Civil Aeronautics Board to the Administrator.

Do the discussions that you have under way now contemplate an extension or a reduction of those areas; would you say?

Mr. PYLE. I would say let's say from our standpoint they contemplated adding to those areas of delegation. Whether or not as we look at the subject objectively that will be the answer, as I say, I think if I answered your question I would be prejudging the issue.

I think this is something where we have to consider what is it we have to achieve? How best can we achieve this as objective employees of the United States Government.

Mr. DOLLIVER. Here is an area where certainly there ought to be fixed responsibility rather than divided responsibility, and it occurs to me perhaps as a matter of principle that this division of authority could well result in what we call passing the buck.

Someplace, somewhere, somebody has to have the ultimate authority for making rules under the Civil Aeronautics Act, and I confess I am a bit disturbed by the fact that there already is a division of authority, and your discussions apparently are tending still further in that direction. At least, that is the impression that I get.

Mr. PYLE. I think I perhaps could clarify your concern in this respect. I think the ultimate responsibility will always have to be with the Board. I don't think we would want to change that.

However, in the actual drafting and drawing up of these regulations—this, we will have to determine by study—we may be able to come up with more regulations that better reflect the problems that are in front of us.

However, the Board still has the right of appeal. The Board still has the right of review. This is as it should be, so that I think we are not dividing.

We are trying to come up with a better way to formulate regulations.

Mr. DOLLIVER. I certainly am glad to hear you say that. Am I correct in my understanding that the Civil Aeronautics Act does give the Civil Aeronautics Board the right to make the rules for air navigation?

Mr. PYLE. As I understand it, but perhaps Mr. Bakke should answer that.

Mr. BAKKE. Yes, sir. I believe there is no doubt whatever about that.

I think there is no doubt whatever that the Civil Aeronautics Act places upon the Civil Aeronautics Board the responsibility of regulation of civil aviation.

Mr. DOLLIVER. Do you agree with what Mr. Pyle has just said, that in all instances the ultimate authority for rulemaking is with the Board?

Mr. BAKKE. Yes, sir; without exception. Section 601 of the act makes it very clear that even in those instances in which the Board may delegate rulemaking authority, it nevertheless reserves for itself the right to review and may, by regulation or otherwise, prescribe procedures for review which shall be followed in any particular case, and the Board has done that in several instances.

Mr. DOLLIVER. I would like to turn to another subject now. That is with reference to the semiautomatic ground control environment. That is a military installation; is it not?

Mr. PYLE. That is correct.

Mr. DOLLIVER. And its chief function is military; something like the distant early warning system?

Mr. PYLE. As I understand it.

Mr. DOLLIVER. It is comparable to that?

Mr. PYLE. Yes, sir.

Mr. DOLLIVER. Does the so-called SAGE system use radar extensively in its operations?

Mr. PYLE. It does. I want to be sure—this, of course, is more or less of a classified problem. However, I think the answer obviously is "Yes."

Mr. DOLLIVER. I certainly don't want to get into a classified problem here in a public meeting, but I do want to find out something about this SAGE system.

Mr. HARRIS. I think Mr. Pyle would be in a position to say whether or not he cared to answer a particular question.

Mr. PYLE. Yes, sir.

Mr. DOLLIVER. I think you just said that this SAGE system does involve the use of radar.

Mr. PYLE. Yes, sir.

Mr. DOLLIVER. You, in your testimony, I think, said that there was some serious discussion going on with reference to the use of the SAGE system for the control of civilian aircraft?

Mr. PYLE. Yes, sir.

Mr. DOLLIVER. A radar system doesn't distinguish in the blips as to whether an aircraft is civilian or military, so on the radar screen it would pick up both the military and the civilian aircraft.

Mr. PYLE. That is correct.

Mr. DOLLIVER. Does the cooperation that you contemplate between the civilian and the military equipment—would that envisage any additional equipment for giving warning or giving directions to a civilian aircraft in the air?

What I am getting at, is the SAGE equipment now well adapted for civilian as well as military use?

Mr. PYLE. I think basically I can answer that in this way, Mr. Dolliver: The SAGE system is basically founded on all this information. It comes in through the radar through various components of the system which is then used, and certain information is thrown aside as being friendly, so they don't do anything with it.

It is our feeling that at some stage, with this accumulation of data, we can extract a lot of this information to use in traffic control, and this is the area in which I feel there is terrific promise, to use this information that is coming in for performance of our own responsibility; namely, the direction of air traffic.

Mr. DOLLIVER. It is a very commendable effort that you are making to coordinate the activities of the SAGE system with the ground control of civilian aircraft because, well, from several standpoints.

One of the principal ones is the matter of economy and saving duplication of installations.

How far have those consultations and negotiations been pursued, and what is the present status of them?

Mr. PYLE. This trying to get together has been going on for about a year. However, I would say that it has acquired a lot more effort behind it in the last 3 or 4 months, both with respect to the Air Defense Command at Colorado Springs and also with the SAGE people.

We have had our people up there working very closely with them, and I would like to point out that this is a two-way street, Mr. Dolliver, in that the Air Defense Command has opened its doors for us and has assisted us and cooperated with us 100 percent, and I think they deserve a lion's share of the credit.

Mr. DOLLIVER. I am encourged to hear that.

Mr. PYLE. It looks like it is going to be a workable system, and the relationship is of the finest. We have very definite problems.

Their mission is somewhat different from ours. They have to look at a different area in the sky. This is the kind of thing we have to sit down and work out together, objectively, and find out whether we can compromise.

We don't look quite as far, and we don't look at a common area. The maintenance problem is a very serious one. They can afford to turn off their radars perhaps. Once they have them on, we have to have them on 24 hours a day. We may have to put in duplicates.

These are the kinds of things we have to work out together. I think we can solve these problems and I think the Air Defense Command feels the same way, and there is an added impetus from their standpoint.

Basically, unless traffic can be identified for them, and that is our mission, for the Air Defense Command, their problem is complicated terrifically. Therefore, we can work together. So this is a two-way street and this just makes it all the more important to come up with the right answer that we are all striving for.

Mr. DOLLIVER. This question occurs to me, Mr. Chairman, a question of whether legislation would be required or even desirable in this field. I think our committee ought to be alerted about it so we can act accordingly, if it seems to be appropriate.

I think that is all, Mr. Chairman. Thank you.

Mr. HARRIS. I am sure it would be very interesting to go into this particular phase some more, as time and circumstances permit. I believe you had Mr. Tippets, who is going to present some additional information.

Mr. PYLE. Yes, sir. Would you like him to take the chair?

Mr. WILLIAMS. Mr. Chairman——

Mr. HARRIS. Mr. Williams?

Mr. WILLIAMS. Before Mr. Pyle leaves, I would like to get back to one question that we intended to query the CAA about, as we did the CAB, and that is the question of whether there should have been a moral responsibility placed on the shoulders of the CAA controllers to have notified both of these planes in the Grand Canyon area of the presence of the other?

You were here yesterday, I believe, and you heard the testimony and the line of questioning on that subject. I would like to have your opinion on that.

Mr. PYLE. This will precipitate a long discussion, because I think we have to go into the background of it, Mr. Williams.

If the chairman wishes, this takes—I can't answer it too simply. Let me say, first, though, that we are entirely in agreement that anything that our people can do for the protection of life in the air is their obligation, and I don't back off from that one iota.

Now, I think what we are really discussing is the effectiveness of what our people can do with the information they have at hand. For instance, if you come into an approach control area, such as Washington, and—I have come into this area many times and I am told all the time I have traffic on the right, traffic at 9 o'clock, traffic at 2 o'clock, and so forth, which is entirely voluntary information.

It is not an obligatory responsibility of that controller to give it to me and yet I am getting it and I am delighted to have it. I don't choose to differ with Mr. Bakke, but I like it, and I am glad to have it.

The problem, though, gets very complex where you don't have sufficient information about the traffic, and this is the area in which the Grand Canyon incident took place. I feel we are discussing one of effectiveness and not whether it was an obligation one way or the other, and in the exercise of that controller's judgment, he might have equally well thought, "Well, United had a flight plan filed at 21,000 feet. Therefore, in all probability he will maintain that altitude. I don't know what TWA is going to do. I have given him the authority to go to 1,000 on top."

He might go anywhere from 7,000 feet to as high as that airplane will go, and he had no way on God's earth of knowing what would happen to that airplane.

Now, I believe he did report at 21,000 feet, but he might have 5 minutes later gone to 23,000 feet just to maintain his clearance from the clouds. Therefore, it becomes in my opinion valueless to give this kind of information to the other airplanes.

Mr. WILLIAMS. As I recall it, both planes reported in at 21,000 within about 3 minutes of each other, and they were in the same general area.

Mr. PYLE. I think that is correct. Well, in that respect, though, they were considerably north of their planned flight. I don't want to infer by that that they weren't maintaining course, because they had no obligation to maintain course, as I think we all know, so there again, is it of any value to notify the other plane that there is a plane somewhere in this area, where we don't know, within 40 or 50 miles of where he was, maybe 20 or 30 miles away from his planned flight?

Mr. WILLIAMS. I don't want to press this to the point of just rehashing everything that was gone over yesterday, but you will recall, of course, that these two planes were flying on course and had the same ETA at their next check point, and both of them having reported in at 21,000 feet, to reach this check point at the same time, just a few minutes later, it would appear to me that certainly it would have been in the interest of safety for the people on the ground to have so notified both of these planes of the presence of the other plane.

I am wondering what harm could be done, if any, by the Civil Aeronautics Administration, or the Civil Aeronautics Board, as the case may be, promulgating a policy to the effect that where practicable, and within the limits of reason, of course, this information should be imparted to these aircraft under those circumstances?

Mr. PYLE. Well, Mr. Williams, we have a chart here which shows the courses.

Mr. WILLIAMS. I can well understand the impracticability of simply making it mandatory.

Mr. PYLE. Would you like to see a chart of these courses, because I think I can explain part of some of the problems.

Mr. WILLIAMS. I think I have the chart in my own mind. I have seen it so many times.

Mr. PYLE. If you will remember, they were to report at Painted Desert.

Mr. HARRIS. I think I would like to have it described.

Mr. PYLE. But Painted Desert is not a fixed position. It is a line of position, and their courses were approximately 16 miles apart at the Painted Desert, and there is no problem there.

Mr. WILLIAMS. Go ahead about 16 miles beyond that.

Mr. PYLE. I stand corrected. It is about 8 miles apart at this line of position, the Painted Desert. Their convergence is out here. Their estimate was 31 on both aircraft. Bear in mind the DC–7 is faster than the TWA.

I may be quibbling. My point is this, Mr. Williams. I think it is a matter of effectiveness, and I don't believe that in this case the controller could have been very effective in notifying the airplane, because bear in mind this is where the accident took place [indicating].

If TWA's man had been looking out the window in accordance with the information, he would have been looking for the airplane down here, but there is where his airplane was, so right there you are giving false information, and fragmentary information of this kind might be worse than no information, and the answer, I think, to the question is:

How can we effectively give them proper information? The only way we can do it is to get the facilities and the communications, navigation aids, and the radar, to do this job. Until we do that, I think we are playing with fire. This is my personal opinion, but I think that is the answer.

Mr. HARRIS. You mean to say that you don't think it would be helpful for a pilot in one plane to know that there is another plane somewhere in that area?

Mr. PYLE. I don't say it wouldn't be helpful, Mr. Chairman. I do say this: There are a lot of other airplanes about which we know nothing here, and we can only give him fragmentary information.

We are not giving him the complete story. This goes into a basic philosophical problem, which, I believe, Mr. Williams and Mr. Mack can appreciate, particularly as being instrument pilots. Sometimes, and I do it myself, and I know I am wrong, and I probably should file a violation on myself, but if you are on IFR flying along, you get a false sense of security. Everybody else knows you are. Of course, if you are out of the clouds, it is your responsibility to avoid other VFR.

It is your responsibility just as much as it is theirs to avoid you. This is another problem that gets into this particular situation.

Mr. HARRIS. Of course, I know my limited experience in driving an automobile. If somebody said, "You better watch; there is a car coming over here," I don't object to that, because I may not have seen the car.

Now, it seems to me like an example when you see how human nature works the same in every type of experience, and when you see these Buck Rogers shows and the like, where they get in a big fight with somebody and someone says, "Watch out, Jim, for that man behind you."

Well, that warning very likely saves him.

Mr. PYLE. Again, I don't mean to quibble. I am in favor of anything, even if it is just one iota, that is going to help those boys up in the air, and we certainly are not going to deny it to them and I know our controllers who are, most of them, pilots, will try and anticipate a problem and take care of it.

They are not restricted to regulations and responsibilities and we don't intend to so restrict them.

Mr. HARRIS. Is the problem that maybe one airline—it is a competitive situation—does not want to embark on a program of another airline plane being advised all the time where he is and that they may try to get there first?

Mr. PYLE. No, sir.

Mr. HARRIS. No problem in that?

Mr. PYLE. No, sir; because these two aircraft had different destinations. One was Chicago, and the other was Kansas City. So there would be no problem in that area.

I think the problem does become practical to a certain extent. We could well overload our communications system by too much of this.

Mr. HARRIS. Of course, around an airport I can very well see it, where they are coming in; they are under surveillance there.

Mr. PYLE. Yet we do it at airports, as I pointed out. We are giving that type of information all the time around airports.

Mr. HARRIS. Did I understand you to say a moment ago that there is now about to be established an airway across there?

Mr. PYLE. Yes, sir; next spring.

Mr. HARRIS. I want to congratulate you on it.

Mr. PYLE. This has been planned for some years. It is a matter of getting our facilities, getting the appropriations first, buying the equipment, building the buildings, installing them, and getting the people in there.

Mr. HARRIS. I suppose in doing that, since they all want to fly over Grand Canyon anyway, the airway will go right over Grand Canyon, will it not?

Mr. PYLE. Yes, sir; I assume.

Mr. TIPPETTS. The control will probably extend to the immediate vicinity.

Mr. PYLE (indicating). It will probably be from one of these facilities right straight across here to Pueblo or Trinidad.

Mr. TIPPETS. There are two groups of facilities going in here. I think that there are roughly three routes that pass over that general area and we have enough navigation facilities to give coverage in a controlled area, an airway, so to speak, that will be 10 miles wide on either of these routes.

Mr. HARRIS. If they are on an airway then, they are better protected, are they not?

Mr. PYLE. Yes, sir.

Mr. HARRIS. We asked Mr. Bakke yesterday:

What would be your comment on the advisability of requiring all commercial airlines, since the traveling public is involved, to travel airways?

Mr. PYLE. I think the problem becomes one of economics from the standpoint that, if we put them all on airways, Mr. Harris, we may delay them considerably, particularly during certain periods. In other words, we will crank in, so to speak, a delay factor.

However, our approach to this problem is "Let's give them the airways they need as fast as we possibly can, as fast as we can get this equipment in and facilities in." That is our approach to the problem. We cannot do it overnight.

Mr. HARRIS. From the traveling public's viewpoint it seems to me that the safety factor might outweigh the economic factor.

Mr. PYLE. We have this problem, sir, and that is this: If they are flying VFR, as to all intents and purposes these boys were, we still have the same problem on the airway as we do off the airways. When they are flying IFR in instrument weather, however, they are fully protected.

Mr. ROGERS. Would the gentleman yield?

Mr. HARRIS. Yes, sir.

Mr. ROGERS. Mr. Pyle, do you have any information as to any conclusions having been reached as to the altitude from which these two planes fell?

Mr. PYLE. No, sir; I do not.

Mr. ROGERS. Thank you.

Mr. WILLIAMS. Mr. Pyle, I think that the purpose in my asking the questions about the responsibility of the CAA controller on the ground in notifying these two aircraft of the presence of the other plane in that area has somewhat been misinterpreted.

The point that I am trying to get to—and it is not an easy point to find—is this:

How much responsibility is placed on these people to exercise their best judgment in promoting air safety by taking such steps, for instance, as possibly notifying these two aircraft.

I hope I make myself clear.

Mr. PYLE. Yes, sir; I understand.

Mr. WILLIAMS. It is a rather hard point to define?

Mr. PYLE. I think the answer to that is we want them to take all the responsibility they possibly can, above and beyond the regulations. I don't think the regulations enter into the picture at all when it is a matter of saving lives, so to speak.

The point where we get into real difficulty in a situation such as this is how effective is this information going to be.

To that end we have to rely to a great extent on the knowledge, the judgment, and the experience of the controller and I personally—and I will stand on this—don't think that he could have really helped the situation one bit by telling United there was TWA traffic in the air.

Mr. WILLIAMS. That is entirely possible.

Mr. PYLE. Let me point out that is personal.

Mr. WILLIAMS. There is a possibility, and I am sure you agree with this, however remote, that had the UAL plane been notified that the TWA plane was in the same area and same altitude, the pilot would

have been a little more on the alert and there is a possibility that the UAL plane would have seen the TWA plane?

Mr. PYLE. I certainly agree with you.

Mr. WILLIAMS. I realize that is grasping straws and rather far-fetched, but, after all, the loss of 128 lives in 1 accident is pretty serious.

Mr. ROGERS. Would the gentleman yield at that point?

Mr. WILLIAMS. Yes.

Mr. ROGERS. The TWA plane knew that the UAL plane was flying at 21,000 feet. They were told that?

Mr. PYLE. Yes, sir; but the United plane did not know of the TWA.

Mr. HARRIS. I go a little further than Mr. Williams does. I do not think it would have been grabbing at straws at all, because I think it is very likely, more than a remote possibility, that it could have been helpful because it was testified and they all admitted that it is general policy in flying that area to fly over the Grand Canyon.

Mr. ROGERS. Would you yield?

Mr. HARRIS. Yes.

Mr. ROGERS. As I recall at the last investigation, or hearings, I asked the last man that had contact with that UAL plane if he notified the UAL plane that the TWA plane was in the area, and he said no, he did not.

I asked him if he knew that they were at the same altitude. He said yes, he did.

Then I asked him if it would have disturbed him if he had been riding on the UAL plane and had known that the UAL pilot did not have that information, if he would have been concerned. He said no, he would not have.

In other words, this man seemed to feel that it was not anything of importance at all that the UAL plane did not have that information.

Mr. PYLE. This may not be completely in agreement with the position of the committee, but I do feel that our real responsibility is to get the positive, complete, and accurate information to these pilots. That is the solution to our problem.

Mr. HARRIS. And that is what you are trying to do with this program that you outlined?

Mr. PYLE. Yes, sir.

Mr. HARRIS. Do you contemplate the necessity of additional legislative authority to carry out the program?

Mr. PYLE. No, I don't believe that will be necessary, sir.

Mr. HARRIS. What about your personnel?

Mr. PYLE. The personnel problem is a serious one. We don't deny it. However, we feel by stepping up our recruiting effort—it is on a crash program—and our training effort, which is likewise an expedited program, that we will meet the requirements. It is all tailored to come up with the answer at the proper time.

Mr. HARRIS. And what you need now is appropriations and a little time?

Mr. PYLE. Yes, sir; we need three M's, men, money, and machines.

Mr. HARRIS. What about the manufacturers that make this equipment?

Mr. PYLE. I would stand corrected by Mr. Tippets on that, Mr. Harris, but I don't think we have any problems in those areas.

We are working closely with the manufacturers to get the best equipment as soon as possible. It is not turned out overnight, but I don't anticipate any problem.

Mr. ROGERS. May I ask one short question?

Mr. Pyle, do you feel, and I mean even remotely, that the commercial airlines exercise a certain amount of influence on the Government agencies that have to do with air traffic, that might deter the Government agencies from going as far as they would like to in some instances, as far as safety regulations are concerned?

Mr. PYLE. No, sir; I do not. I will say this: That they are of great assistance to us in many areas. For instance, in the study of traffic control problems.

I will say this, as far as I am concerned personally, negative.

Mr. ROGERS. Do they ever work on you to try to get you not to do some things?

Mr. PYLE. They haven't tried me.

Mr. ROGERS. Thank you, sir.

Mr. HARRIS. Mr. Mack.

Mr. MACK. I would like to know if the Civil Aeronautics Administration has any policy concerning joint operation of military and civilian planes off the same field? Are they encouraging such an operation, or what?

Mr. PYLE. Mr. Mack, I think, to be absolutely honest with you, this is a very difficult area. It depends to a great extent on the nature of the military operation and of the civilian operation.

Mr. MACK. Do you have a policy concerning jet operations today jointly with reciprocating engines?

Mr. PYLE. I think the correct answer is that the policy is that it is to be encouraged wherever practicable and economic to do so.

Mr. MACK. It is to be encouraged?

Mr. PYLE. Yes, sir.

Under the President's air policy which came out in 1954, that was one of the recommendations that was made. I think we have to watch this one very, very carefully from the standpoint of safety involved.

The jet airplane is, of course, fast. It has certain control problems at low speed that we have to respect. Visibility is restricted because of the very nature of the construction of the beast, and I think we have to watch this one closely.

I am not overly enthusiastic about it. I will put it that way.

Mr. MACK. In St. Louis they have the McDonnell operation and a small Navy operation off the municipal airport and there has been considerable pressure placed on I think McDonnell to move out of St. Louis, and none of the pressures is coming from the Civil Aeronautics Administration.

Mr. PYLE. I will be honest with you, sir, I do not know all the circumstances of that particular problem. I realize it is a serious one. I propose to get into it.

Mr. MACK. You say the Civil Aeronautics Administration has encouraged joint operations as a general policy.

Mr. PYLE. I think in answer to your question as a general policy up to the present time, it has.

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Mr. HARRIS. We have gone well past the noon hour. I think probably it would be advisable to recess now until 2 o'clock.

(Thereupon, at 12:35 p. m., the committee was recessed, to reconvene at 2 p. m., same day.)

AFTER RECESS

Mr. HARRIS. The committee will come to order.

STATEMENT OF JAMES PYLE, ACTING ADMINISTRATOR; GERALD F. WHITE, CHIEF, ENFORCEMENT AND LITIGATION, GENERAL COUNSEL'S OFFICE; JOSEPH H. TIPPETS, DIRECTOR, OFFICE OF AIR NAVIGATION FACILITIES; WILLIAM DAVIS, DIRECTOR, OFFICE OF FLIGHT OPERATIONS AND AIRWORTHINESS; DAVID D. THOMAS, DIRECTOR, OFFICE OF AIR TRAFFIC CONTROL; JAY MEISEL, PERSONNEL OFFICER, AND HERBERT H. HOWELL, DIRECTOR OF AIRPORTS, CIVIL AERONAUTICS ADMINISTRATION—Resumed

Mr. HARIS. Mr. Pyle, I believe when we recessed for the noon hour, you had completed your statement and answered such questions as were asked by members of the committee. If I recall correctly, you were about to present your Mr. Tippets for some further explanation and clarification of some technical phases?

Mr. PYLE. I think it was the committee's desire to get further presentation on the airways structure.

Mr. HARRIS. Yes; I would like to hear from someone who is familiar with that program.

Mr. PYLE. I will ask him then to do that. I think he can do it much better than can I.

Mr. HARRIS. Mr. Tippets, I believe you have already been identified for the record and in view of the fact that Mr. Pyle did not cover the civil airways of the Nation, I take it it would be helpful, at least I think it would be helpful, if you would just describe when they were established and what has been done in the interim about establishing new ones and what the future outlook is.

Mr. TIPPETS. Yes, Mr. Chairman.

If I might, I would like to stand and I will refer to this chart as we discuss this.

I might say, however, that Mr. Pyle's testimony and the subsequent questioning by the committee has pretty well highlighted most of the facts, and I will try to draw them together on this chart.

The map before us is one of the United States and has been prepared to depict for you those areas known as controlled airways versus those areas where there is no controlled airway service. The chart has been prepared to delineate the controlled airways as opposed to those areas where there is no control service rendered by the Civil Aeronautics Administration.

The shaded or light blue areas are those routes within the United States wherein the CAA, as a consequence of evolution of requirements, has built what is known as the Federal airway system. By that, we mean adequate communications from the controller to the aircraft

in flight, and adequate navigational information from the ground to the aircraft in flight, so that traffic control service on the ground can be given to the aircraft.

The growth of this system, as you can see, which is very vast throughout the United States, has been in evolution since about 1926 when the airways were primarily made up of beacon lights and intermediate fields. Subsequently, as electronic aids came into being, the airways were implemented with radio devices to aid instrument as well as night flying, and to allow 24-hour reliable service to be rendered to the public between these communities which were served. The growth of the airways has been very steady. As rapidly as traffic demands have indicated the needs, and as fast as we have been able to get funds and equipment installed, the system has been expanded.

These represent the facilities that Mr. Pyle discussed in detail. We have the air traffic control centers wherein the actual flight planning and the arrangements of flights in space are coordinated, the communications stations, the various kinds of navigational aids, the en route as well as the terminal area aids.

In years past we have operated what has been known as the low frequency radio navigational aid system. This system has its limitations. It was limited to four courses and did not allow enough flexibility in operation, and also, when needed the most, under heavy static conditions, became only partially usable, if not unusable, at certain times.

Mr. DOLLIVER. What do you mean by low frequency?

Mr. TIPPETS. That is generally referred to as the 200 to 400 kilocycles in this particular instance.

Prior to World War II, the improvement of electronic aids demonstrated conclusively that the high frequency or very high frequency, roughly in the 100-megacycle band, was so much static free and techniques could be devised to the point where multiple courses could be emitted from a facility, as compared to the few courses in the low-frequency aids.

The CAA, in connection with its user coordination, both military and civil, embarked on a widespread program of replacing the low-frequency system with this high-frequency system of navigational facilities. This program is still being expanded and eventually will blanket the United States above 15,000 feet with navigational aids so that traffic control services can be given much greater flexibility and improved standards.

We now have 500 of these high-frequency aids installed and roughly——

Mr. HARRIS. Are those the big rings there?

Mr. TIPPETS. No, sir; that is another chart having to do with radar, which I will talk about later.

Mr. HARRIS. Those are on the upper chart?

Mr. PYLE. Yes, sir. They are located in these shaded areas and are near enough together to give navigational coverage at all the usable altitudes along those routes. There are 500 of them.

Mr. DOLLIVER. What is the technical name for that system?

Mr. TIPPETS. The VOR or omnirange.

Mr. DOLLIVER. Of the 500 VOR ground installations, how many also have the distance measuring equipment?

Mr. TIPPETS. There are the 234 that actually have the distance measuring equipment with them at this time. As I mentioned this morning, there were 454 funded, but only 234 in operation.

Mr. DOLLIVER. Because of the new developments that have transpired in the meantime.

Mr. TIPPETS. Yes, sir. To continue as we have implemented this system with these newer devices, and we have slowly tried to phase out the old or obsolete low-frequency systems. This has been a slow process becaue there is a need for the aircraft to be implemented properly in order to have accommodation on the very high frequency or the new-type navigational facilities.

We have at the present time, in excess of 100,000 miles of controlled airways by using the Victor or the omnirange system. We still have in being about 65,000 miles of the low-frequency airway. As aircraft become equipped with the more modern devices, the low-frequency system will be phased out. This will be some years ahead because there is a great deal of military airborne implementation to be realized before this can be done.

The No. 1 requirement is to get coverage by Rho Theta navigation over the whole United States at 15,000 feet and above, and to continue the corridor or the conventional airway structure down to near the ground, roughly 700 feet. We hope to have that implemented by 1965.

Additionally, in CAA's plan of improvement we are putting in VHF communications, that is, the air-ground service, the controller-to-pilot team of direct communications at 15,000 feet and above all over the United States in a similar fashion.

The third element in this plan, and this is the circles on this chart [indicating] is to get blanket coverage of the United States by the use of long-range radar to give the controller so-called eyes to see, as well as his communications, and the navigation facilities to go with them.

So, in effect, above 15,000 feet, our plan is to have the whole United States in this sort of shaded area where traffic control can be given greater flexibility and more use. These, of course, are the major elements, these 3 things, of the 5-year plan.

The other items that we are involved in, Mr. Pyle also talked about, our relationships for the use of military radar as compared with our own, and we do hope to make maximum use of these facilities wherever they can be feasibly used.

I would like to say this in clarification of some of the questions this morning. This is really two answers to the SAGE or radar.

One is the possible use by CAA of radars wherever they are, without regard to the aspects of so-called SAGE system.

The second phase of this will be a determination on our part as to whether or not the automatic section of the Sage system can be incorporated to one extent or another, depending on the operational use that can be made of the SAGE system itself.

Mr. DOLLIVER. Did I understand you to say that there are some nonautomatic parts of the SAGE system that can be readily utilized by the civilian air service?

Mr. TIPPETS. These are the radars that serve the SAGE system, and this is the area we are now working on intensively to see if we cannot

relay this data to the control centers to make it available for our use. We are working to find out whether or not the automatic part can be used in the limited basis or extensively.

Mr. DOLLINGER. It would seem to me, with the limited knowledge that I have, that the nonautomatic part of the SAGE system ought to be quite usable by civil aeronautics for flight control.

Mr. TIPPETS. It is in this area that we are spending the bulk of our time to see which ones can be used. I am sure you can understand that, while the Air Defense mission is similar to ours in that we want to see all the airplanes, there are defense missions, particularly on the coast, which require a more stringent attention to defense purposes than in the terms we have. It is in these areas that compromises are being worked out and we are not prepared to say to what extent we can do so, but our efforts are to do the utmost possible and I might say that we are getting the greatest cooperation from the Air Defense Command.

I am trying to keep this as brief as possible because you asked questions that covered it this morning quite well.

The question was asked as to the general growth of the airway system over the period of years.

There has been a constant growth as the operational requirements have demanded of us and funds and equipment have been available, and I have some specific figures here.

Back as far as 1952, we had 57,000 miles of these airways.

In 1953—I am speaking now of the high-frequency omniranges—73,000; in 1954, 84,000, and in 1955, 99,000, and it is well over 100,000 at this time.

So there has been a constant growth and expansion within the availability of funds and our ability to do so.

The same is true in all of our facility area. We have criteria as to when an airway is commissioned, we have criteria as to when we install instrument landing systems, lights, towers, and all of the activities that we put in in the way of facilities and services, which are done so as a result of a coordinated criteria worked out between ourselves, the military, and the industry in keeping with the operational need and economic ability to so implement our system.

I have a number of specific figures if the committee would like to ask any questions, sir, so that I can see any questionable areas that you would like to know more about.

Mr. DOLLIVER. I would like to ask a few questions about this upper map, the present airways system.

I do not know what color those lines are. Do they represent the airways?

Mr. TIPPETS. These rather green or bluish-green shaded areas. The orange areas are areas where you have the centers for flight control. They only designate the 26 domestic air-traffic-control centers.

Mr. DOLLIVER. It appears to me from that map that the airways system as outlined there mostly refers to the long-distance as distinguished from local service airlines.

Mr. TIPPETS. Not exactly, sir.

This configuration has grown up over a period of many years just as a matter of economics and the traveling character of the users of the airspace. They have developed a pattern pretty much as the highway

pattern, but as time has gone on, there is of course more demand for routes in those areas where we are not able to provide them for lack of people or facilities, and it is in that direction that our 5-year plan is pointed so that we can implement these light areas where today we do not have airway facilities or airway services.

Mr. DOLLIVER. Is it not true that there are some of the local service airways, local service airlines, that do not have the complete facilities of the airway system as delineated on your map?

Mr. TIPPETS. That is true, sir; there are some that are that way and as fast as they are able to meet our criteria, we would hope to compensate for that.

Mr. DOLLIVER. The fact is that some of your local service airlines are relatively new and the further fact is that some of them are mostly on visual flight rules; are they not, completely?

Mr. TIPPETS. I cannot speak to that, that most of them are, sir.

Many of them have some low frequency facilities of their own and exercise off-airway flight such as you discussed this morning in some detail. They have off-airway authorizations.

Mr. DOLLIVER. Would you define that term "off-airway"?

Mr. TIPPETS. This is the area you discussed this morning concerning the Grand Canyon accident, when people are outside controlled airways. When they are there, they have to recognize that and operate under those conditions.

Mr. DOLLIVER. I am thinking of the airport in my home community, Fort Dodge, Iowa. Frequently, in bad weather it has to be overflown and I presume it is because they have no electronic facilities for bringing the planes in; is that it?

Mr. TIPPETS. Very likely, and they do not have traffic control that guarantees them separation in and out of there.

Mr. DOLLIVER. Of course, they probably could not afford it and the cost would be out of proportion to the amount of traffic, I suppose, in a good many of the smaller airports?

Mr. TIPPETS. There are a lot of small airports where there is no designated controlled airways or controlled zones around those airports; no traffic control is available there.

Mr. DOLLIVER. Is it contemplated under the long-range radar plan which is delineated pretty much on your second map that some further facilities, some further improvements might be made in these local service airlines in and out of the small airports in bad weather?

Mr. TIPPETS. Our plans, sir, are very extensive, not directed toward local service airlines as such, but toward users of airspace.

In our 5-year plan, in looking forward to its revision every year, our Office of Flight Operations and our Air Traffic Control Office watch the operational needs in those areas, and when these communities or these areas measure up to what has been accepted as a general criteria for implementation of traffic-control facilities, then we will implement them.

I think over the next several years you will see rather widespread implementation in this regard. I have some specific figures to show you what I mean.

Mr. DOLLIVER. Before you get to that, let me ask you: Is not the main criteria a question of volume of traffic in and out of the airport?

Mr. TIPPETS. It is volume of traffic which is the primary one but

we do take into account the complexities of a particular locality and its size that might require an exception or a deviation.

You can readily understand that almost every community does want a control tower or approach lights or something. As a matter of economic necessity, we have had to find a proper balance and to establish an acceptable criteria for the users and ourselves so that we could go to the Congress and say, "This now meets our forecast to meet our needs for next year."

Volume is the primary one, but it is not the only criteria.

Mr. DOLLIVER. Now, go ahead with those figures.

Mr. TIPPETS. I was just going to say that in connection, and I will read several here so that you can see, and this will be in some part a recapitulation of a chart earlier provided.

We have now in operation 35 airport surveillance radars but there are a total of 49 of them funded, meaning that 14 of them are now being installed and will be operated shortly. Already there are 44 more in the United States that meet criteria and need to be funded and installed. This is in our so-called telescope 5-year plan or the 3-year plan.

Mr. DOLLIVER. At this point, I assume that most of those are surveillance radar, do you call it?

Mr. TIPPETS. Yes, sir.

Mr. DOLLIVER. Those are in the large centers of traffic?

Mr. TIPPETS. For the most part, yes, sir. Their requirement for surveillance is 2,000 annual instrument approaches.

Mr. DOLLIVER. Annual instrument approaches?

Mr. TIPPETS. Yes, sir.

That means that 2,000 instrument approaches have been made at that airport.

In the case of instrument landing systems, we have in operation now 158, with 170 of them funded, and others in the process of being installed. There are already 28, and I happen to know at this moment many more that require instrument-landing systems because they meet our criteria for 700 annual instrument-approach operations.

In our plan, we will request funds for these added facilities.

Mr. DOLLIVER. I take it from that remark that the surveillance radar and the instrument-landing system are not mutually exclusive?

Mr. TIPPETS. The surveillance radar is primarily a traffic-control tool used to separate the traffic in the terminal area while the instrument-landing system is used for low approach and landing purposes. They are complementary.

Mr. DOLLIVER. Yes.

Mr. TIPPETS. In the case of omnirange that we have talked a good deal about, we now have 500 of those funded and 383 additional planned in the 5-year plan, but it is contemplated that under the needs for the next 10 years that between 1,100 and 1,200 of these facilities will be needed throughout the country. Some will be in the en route area and others used for other purposes, but they will be more modern, static-free.

Mr. DOLLIVER. The omnirange serves still another purpose?

Mr. TIPPETS. It serves primarily the en route navigation needs. It gives to the pilot in the cockpit the visual indicator and he flies a particular course.

There are some omniranges that will be used in the terminal areas for approach when an ILS is not available and when they can be used to serve a dual purpose.

In another direction, towers in the terminal area, the operation requirements for towers will grow very, very fast because of the increased volumes of traffic and we expect the number that we now have, roughly around 180, will be greatly increased.

There is an additional 40 more in the first preparation of the 5-year plan and many more already exceeding our 24,000 annual itinerant operations criteria.

So our whole effort is directed toward expanding to meet the requirements of aviation, both civil and military, where our responsibilities lie, and it is to that end that this 5-year plan is directed.

Again, it is around these three fundamental elements, more navigation, more communications, and more radar, to increase the flexibility and make greater use of the airspace that we have.

Mr. DOLLIVER. That is all, Mr. Chairman.

Thank you.

Mr. HARRIS. Mr. Hale?

Mr. HALE. No, thank you.

Mr. HARRIS. Back to the point that Mr. Dolliver was discussing with you a moment ago; what is the criteria for establishing an airway?

Mr. TIPPETS. An airway is established as a general rule when it has 20 instrument flight operations a day through a particular route, with any 2 fixes. In other words, airplanes may be passing through an airway or potential airway and crossing over a particular fix, and if there are as many as 10 of those, we try to get the navigation aids and communications.

Mr. HARRIS. What navigation aids does it take?

Mr. TIPPETS. I think you have to look at this in this light, sir:

The navigation aids are line of sight kinds of facilities. That means they function out at the low altitudes just as far as you can see, so-called, the line of sight proposition. But at the higher altitudes they go up to many thousands of feet, and you could use the term "infinity" if you wanted. If you wanted an airway between point A and B, maybe that facility at A and B would be such as to bring you down to the minimum altitudes so that our flight operations would serve as a safe operation for that particular route.

Mr. HARRIS. Control tower is part of that facility, is it?

Mr. TIPPETS. Not necessarily.

The control tower is for terminal use, as Mr. Pyle explained. It has a corollary use. It is used to help a center in certain approach facilities but when you try to establish a facility you try to give safe coverage at usable altitudes and where there is adequate communications, either through company or Government communications, so that the pilot is always in communication and always has navigation, and that establishes an airway.

You might find that at point A and B one facility at each area in the way of communications and navigation might be sufficient; but, if that is sufficiently distant, maybe it takes in-between points. Maybe it takes 3 or 4 navigational aids in between so that there is continuous coverage all the time at the instrument altitudes that are certificated for use.

Mr. HARRIS. Mr. Dolliver used his hometown as an example of the situation regarding local service air carriers, and we can use an area that I am most familiar with and better understand.

Now, from Memphis to Little Rock to Dallas is an airway, is it not?

Mr. TIPPETS. Without checking, I assume that it is. Let's assume that it is.

Mr. HARRIS. Then from Memphis to Shreveport is an airway? You cannot tell by looking at that map.

Mr. TIPPETS. Not directly, sir, without taking a few moments.

Mr. Thomas may remember that, and I assume it is a controlled airway.

Mr. HARRIS. If Mr. Thomas is here and if I am incorrect, I wish he would correct me.

Mr. THOMAS. That is correct, sir.

Mr. HARRIS. It is from Memphis to Shreveport?

Mr. THOMAS. That is my recollection.

Mr. HARRIS. From Dallas to Shreveport through to Atlanta is another airway, I believe?

Mr. TIPPETS. Yes, sir; that is correct.

Mr. HARRIS. Now, a plane which goes to Little Rock and then from Little Rock to Shreveport would have to fly a roundabout way to get there on an airway. You have the facility at Little Rock and you have a facility at Shreveport. What would be wrong with establishing an airway from Little Rock to Shreveport direct, which would go right over my hometown, El Dorado, Ark., where they are existing communication facilities?

Mr. TIPPETS. If the traffic volume would warrant it, and if in fact the navigation aids and communication facilities were adequate, then we would establish an airway. It is a question maybe in that instance as to whether or not there is sufficient instrument flying demand on that airway to require a route structure.

Mr. HARRIS. Well, they tell me, of course Barksdale is in Shreveport and the military uses that area through there all the time. Now they are about to open the airbase at Little Rock. It is a jet base. The planes are flying through this area all the time.

Trans-Texas people have complained about the situation and their problems there. Civilian planes, that is, business anad other types of planes, go in there all the time. They have asked me what would be wrong with establishing an airway from Little Rock direct to Shreveport, since you already have the facilities in Little Rock, you already have the facilities in Shreveport, you already have the communications facilities halfway between, and it is assumed that there would not have to be any further installation of facilities.

Mr. TIPPETS. I will ask Mr. Thomas to help me study these situations very carefully. There are a number of unimplemented routes that should be implemented. There is a lack of personnel in some instances and a lack of equipment in others.

Mr. HARRIS. This is not an isolated instance. I imagine there are many others?

Mr. TIPPETS. There are.

Mr. HARRIS. If it could be done where it would not require any additional facilities or any additional personnel other than those on the job now, it seems to me as though it would be a lot better for the

industry and the flying public if that additional safety could be provided.

Mr. TIPPETS. If I might just for a moment ask Mr. Thomas, we have a map that shows the unimplemented areas.

Mr. HARRIS. If he has the information, but I would not want to delay the proceedings here. I am using that as one example that I know something about, and I know if there is one there are bound to be others all over the country.

Mr. THOMAS. Mr. Chairman, if I may?

Mr. HARRIS. Mr. Thomas, if you will identify yourself for the record.

Mr. THOMAS. David D. Thomas, Director, Office of Air Traffic Control of the Civil Aeronautics Administration.

We have this chart, which may not be easily visible from the Chair. This chart shows volume of traffic as it is related to the airways and as it is related to the services that we now provide. The orange lines shown on the chart, which may not be easily visible, are those routes now flown which now qualify for airways and air traffic control services which we do not now have the resources to provide the service.

Specific reference to Little Rock and to Shreveport: as of the date of this chart there was not the required flying called for, which is 20 flights per day over the route or a pair of cities that exchange 10 flights.

Mr. HARRIS. I think you will find more planes than that per day going out of the airport from my own hometown.

Mr. THOMAS. To Shreveport?

Mr. HARRIS. Both ways.

Mr. THOMAS. These are instrument flight rule flights.

Now, assuming that there is, this chart does not reflect it, there are additional things required to establish an airway to make it effective and provide the traffic control services.

First of all, there must be a ground communications network, which is usually interphone—full-time telephone line—so the controller can get the adequate information.

Secondly, there must be control personnel in the appropriate centers who have the time and the tools to take the information, post, correlate it, and determine whether or not there are conflicts in the traffic and to actually control the traffic, even though the other physical things are available.

We have several cases today where we do have navigation facilities, and we do not have the control personnel to actually take over the control of the airways, but will do so as soon as our training programs permit. We will do in some cases as soon as the telephone lines which are required are in and all the other things.

All the lines shown on the map are included in our planning and we will take these routes over and provide for that control just as rapidly as possible.

Mr. HARRIS. As an example, since we are talking about this one area that I am familiar with, you do have all the facilities at Little Rock; do you not?

Mr. THOMAS. Yes, sir; we have a communications station and a control tower at Little Rock.

Mr. HARRIS. Now, you do have all the facilities at Shreveport; do you not?

Mr. THOMAS. We likewise have a control tower and a communications station.

Mr. HARRIS. What additional facilities would you have to have between Little Rock and Shreveport to establish an airway between the two points?

Mr. THOMAS. If I may say so, sir, neither Little Rock nor Shreveport would control the traffic between Little Rock and Shreveport.

Mr. HARRIS. All right, about halfway.

Mr. THOMAS. No, sir; we have the area of the United States divided into 26 centers where all the information is gathered together. If my recollection is correct, Little Rock is in the Memphis center. Shreveport, I am not sure, but I believe it is in the Fort Worth center.

Mr. HARRIS. I would think that would be right.

Mr. THOMAS. Now, we would have to have sufficient personnel—this I cannot answer right now—and posting space and communications circuits in Memphis and Fort Worth and tie it back into Little Rock and Shreveport in order to take that over as controlled airspace.

Mr. HARRIS. Which you do not have now?

Mr. THOMAS. I say I do not know, sir. Generally, we do not. I do not know in that specific instance.

Mr. HARRIS. I know it would be difficult to pick out any one place over the country.

Mr. THOMAS. I can answer this generally.

We do not have the resources to control all of the noncontrolled routes shown on the map, and this is part of the request in our 1957 estimate. We now have money for extending control over many of the routes but sufficient time has not been available to get into new buildings and train more people.

Specifically on this one route, I do not know.

Mr. HARRIS. Sometime when you do not have anything else to do down there, look it up and see what the situation is.

Mr. THOMAS. Yes, sir.

Mr. HARRIS. Mr. Pyle?

Mr. PYLE. I think there is one point Mr. Tippets may have made that gave you a wrong impression. Sometimes we get so close to these things that we do not realize some of the things we say may be a little misunderstood.

It requires not only navigation facilities at point A and B, as he said, but it may require 3 more between those 2 points.

So the fact that we may have the proper facilities at Little Rock and at Shreveport does not mean that the airway would have adequate coverage from the standpoint of pilots flying direct from one point to the other.

Mr. HARRIS. I see what you mean and hear what you say but I do not understand the situation because I know that area there. I know they have the facilities at Little Rock with which they direct the planes out of there. I know the facilities are in Shreveport and I know you have this station halfway between with a control tower and communication facilities there where they go right over it.

What I do not understand is what do you need anything else for?

Mr. TIPPETS. It could be the lack of personnel in either of the two centers. I suggest that we give you the reasons why they are not in that class.

Mr. HARRIS. I repeat that I do not think it is different from a lot of other instances over the country, but it does seem to me that you could utilize the existing facilities in these areas to improve the situation.

I have on file here several hundred letters from people all over the United States who have written me about these things.

Mr. TIPPETS. There are really three things why they do not commission; personnel, lack of navigation, and lack of communications. It is not always all three of these things, it could be any one of the three.

We expand as rapidly as we can meet those demands. We could find that one specifically, Mr. Chairman.

Mr. ROGERS. Are you through, Mr. Chairman?

Mr. HARRIS. I believe so.

Mr. ROGERS. Mr. Tippets, have you worked out any breakdown of the costs of these proposed airways that you need?

Mr. TIPPETS. These orange routes?

Mr. ROGERS. Yes.

Mr. TIPPETS. I do not have those figures with me but we can tell you specifically in each instance what they do cost.

Mr. ROGERS. Is it a per mile cost or per route cost?

Mr. TIPPETS. Based on an individual route requirement such as personnel, navigation, or communications needs.

As I mentioned, between A and B maybe nothing is needed, but maybe 3 or 4 facilities are needed in between to give reliable coverage depending on the terrain and so forth. You would not really get a representative figure if you divided the whole United States route structure by the total capital investment.

Mr. ROGERS. This map here, I notice that you have a wide green area between Dallas and Oklahoma City. Does that mean that is a controlled area?

Mr. TIPPETS. Wherever that green area is; yes, sir.

Mr. ROGERS. In other words, you cannot fly in there without being in a controlled area?

Mr. TIPPETS. Not under instruments.

Mr. ROGERS. If a plane is flying under VFR conditions, private plane or otherwise?

Mr. TIPPETS. It is no problem.

Mr. ROGERS. Thank you, sir.

Mr. HARRIS. Mr. Mack?

Mr. MACK. When you establish a new airway such as the one Mr. Harris talked about, is that over a great distance or is it your intention to have a system of shorter airways?

I am speaking of green 5 or whatever the title happens to be. If you had a short distance to fill in from Shreveport to Little Rock, would you try to organize a system across the country, a north and south route, that would fall in this area between Little Rock and Shreveport?

Do you understand my question?

Mr. TIPPETS. If I do, sir, I think the answer is, not necessarily. We try to meet the operational requirements as expressed by traffic control as quickly as they meet the operating criteria, regardless of direction, as long as it fits into the system of services we have.

Mr. MACK. There would be no effort to extend the airway from Little Rock to some other point or Shreveport to some point south of there?

Mr. TIPPETS. There would be an effort to go wherever the requirements were. In other words, regardless of where this terminus is, if traffic control requires facilities, then we provide them for them regardless of their location or the particular direction. It ties into a system concept that everything gets back to the operating center or the air route traffic control center where the flight plans originate and where they are coordinated.

I am not sure I have answered your question yet.

Mr. MACK. I think you have.

My question, of course, was whether you are going to try to tie in all of your airways on a national system of airways. In other words, when you put a new one in this area, if you would not try to have it continue between two terminal points a thousand miles apart.

Mr. TIPPETS. They are tied into the system.

Mr. MACK. As you extend these airways, are you going to have to change your airways because of the speed of the aircraft in use?

Mr. TIPPETS. I think maybe Mr. Thomas is better qualified to talk on that. All I can say, in a general sense, is that the concept in area control above 15,000 feet is to give greater flexibility and the route structure can vary.

Mr. MACK. In other words, there is a possibility you will develop new airways for flights above 15,000 feet?

Mr. TIPPETS. Yes, sir.

Mr. MACK. Or 25,000 feet, to take care of that traffic?

Mr. TIPPETS. Yes, sir.

This map Mr. Thomas had with those orange lines on it was indicative of the routes you had with high altitude long distance that have no relationship to the present configuration of the airway structure.

So, in effect, you create a new kind of route structure at the higher altitudes.

Mr. MACK. That answers the questions I had in mind and that was whether it would not be necessary to eliminate some of your present reporting points because of the increased speed.

Mr. TIPPETS. Certainly that is one of the considerations.

Mr. MACK. That is what you would be doing by establishing new airways?

Mr. TIPPETS. Yes, sir.

Mr. MACK. I do not have any further questions, Mr. Chairman.

Mr. HARRIS. Did you have any other comments?

Mr. TIPPETS. No sir; I kept this brief because Mr. Pyle, in response to your questions, covered a great deal of it this morning very, very well.

I would say this: That in the Civil Aeronautics Administration, the Office of Air Traffic Control and the Office of Air Navigation Facilities work very closely together on the establishment, No. 1, by the Office of Air Traffic Control, of requirements based on the load of

the system, and it is our job to devise the system with facilities to meet these requirements. It is a carefully coordinated program and all our resources and efforts are directed toward taking the first priority things first, and our whole plan for the expenditure of these new sums of money is directed toward alleviating many of the things you discussed yesterday and today.

It will take a little time, but we not only think we know what can be done today with the state of the art, but we are proceeding to go ahead as fast as we can get the equipment and get it installed and operating in the system.

Mr. HARRIS. You are having better luck with appropriations now?

Mr. TIPPETS. Very much so. We have a total of $75 million this year for new capital investment money.

I might say that the present system, as you see it in a general sense, represents about $171 million of capital investment. We contemplate, of course, in the original 5-year plan a figure of $246 million for this expansion program and this will change and vary and get further along as year-by-year we modify the plan in keeping with the new requirements.

Mr. HARRIS. Thank you very much.

Mr. Pyle, we asked Mr. Bakke yesterday a question you may not want to comment on it because I realize this is a policy matter, but would you care to express your own viewpoint from the experience you have had as to the advisability of reestablishing the Independent Safety Board?

Mr. PYLE. I think I will have to answer that question in this respect, Mr. Harris.

I am not too familiar with some of the background on that. I was on overseas assignment with an international airline and was out of the country when that was going on, so I do not believe I would be qualified, and I have no fixed opinions on that at this stage of the game. I do not mean to dodge the question.

Mr. HARRIS. I appreciate that.

I do know over the years we have heard a great deal from certain sources about the need for reestablishing the Safety Board as an independent agency of its own.

Now there is another area of information that I would like to ask a few questions about that should not take but a few minutes, and that is with reference to personnel.

I believe it was developed here yesterday or during the hearings anyway that you had been negotiating with the Civil Service Commission regarding the development of standards and so forth governing the compensation of traffic control personnel. Is that true?

Mr. PYLE. Yes, sir; that is true.

Mr. HARRIS. Out of that, what is actually the situation? What is the role of the Civil Service Commission in making these determinations?

Mr. PYLE. Mr. Chairman, if I could I would like Mr. Jay Meisel, our personnel officer, to answer this question for the committee.

I would like to say, however, sir, that our traffic control system in essence is only as good as the control personnel that form an integral part of this system. They have done a superlative job and I think we owe it to them to do everything in our power to get them the compensation we feel they merit.

Mr. PYLE. Mr. Chairman, if I could I would like Mr. Jay Meisel, our would come forward to answer your question.

Mr. MEISEL. My name is Jacob Meisel, personnel officer of the Civil Aeronautics Administration.

Mr. HARRIS. Did you get the question?

Mr. MEISEL. Yes, sir.

The Civil Service Commission is charged by law, which is the Classification Act of 1949, with responsibility for developing and publishing standards which control the executive agencies in establishing rates of pay, so that their role in connection with the pay rates of controllers is essentially the same as it is for other positions in the Federal service.

They determine what criteria we shall use in deciding what particular rate of pay to pay each individual controller.

Mr. HARRIS. In view of of that and the responsibility, then, of the Commission for the program, from your experience and what you know about it, could you indicate whether or not the representatives of the Commission did inform themselves sufficiently as to the problem regarding the nature, as to the duties of the office, the level of responsibility, and so forth, of such traffic controllers?

Mr. MEISEL. I can tell you the extent to which they have done this. Whether it is sufficient or not, it is their determination.

I do know they assigned an analyst to this project some 2 years ago and that analyst spent approximately 2 weeks visiting our facilities in the New York area. Part of that time was spent in the regional office discussing the job with the regional line supervisors. The remainder of the time was spent between the centers, the LaGuardia tower, Idlewild, Teeterboro, and the communications stations in that vicinity.

The supervisor and that analyst, two of them, one is a group leader and one a section chief, each spent between 2 and 3 hours one day out here a the National Airport. Beyond that, the information they have about these positions is information they received in our formal submissions and in a series of conferences between ourselves and them. They made no other field coverage, no other personal investigation of these positions other than the two places I mentioned.

Mr. HARRIS. Are there any further negotiations underway that you know anything about?

Mr. MEISEL. Yes, sir.

Mr. HARRIS. What is the status of them?

Mr. MEISEL. We have currently pending with them our proposals for changes in the grade pattern. These they have under consideration and we have been told informally that they will accept in principle what we have recommended for traffic control towers and centers. We have gotten no formal indication from them and we are in a series of meetings at the present time in which we are working out details of language in these criteria. It is a series of questionings on trying to resolve specific points on exactly how the criteria will be expressed.

This is the culmination of quite an extensive period of negotiations. This has been going on now for some 2½ years approximately.

Our negotiations through the entire period of time have been a series of such detailed conversations, without any significant argument as to basic principles.

Mr. HARRIS. What are some of these points of difference?

Mr. MEISEL. The first major one was a position we took that the grades of the controllers, for example, must be based upon the level of activity at the particular location. We feel that that is right significant because of the fact that the controllers shift from one operating position to another during their tour of duty. They also change watches, that is, the hours of the day on which they are on duty, so that there is no way we can figure in differentiating individual controllers assigned to a given facility.

The Commission took the position that it was necessary to relate criteria to individual controllers and that has gotten us into the position of trying to create artificial formulas for subdividing activity at a given location to come up with averages per man. This has been unrealistic, we have felt, though the Commission has insisted that it was necessary. It served in many respects, we think, to camouflage the real areas of responsibility.

One of the significant elements, for example, has been the fact that at our busiest locations where we have the greatest concentrations of traffic to be handled, the number of people assigned is typically the largest. The average per man at such locations tends to be low rather than high because the sheer concentration of traffic limits the span of concentration and attention of one man. He must get a small span to handle it properly. Men at those locations would come up with lower grades than those with less dense traffic to cope with.

We could not quite see that point.

Another type of thing that has come up, I can best cite an example in connection with air route traffic volume centers.

We had proposed a criteria for identifying the heaviest activity centers as one which would have a peak operations per day of 500 IFR. We have included a proposal which would avoid the freak situation where you had it happen once, but it would be unusual, and to provide that the normal pattern of activity at such location would approximate that level.

The kind of negotiations we have been in on that is how many days a year is it necessary to approximate that level, what percentage of the time that type of thing which, one, we do not have figures to support; and, two, they have no real meaning in terms of difficulties and responsibility vested in the individual controller, and should not be a determining factor in arriving at the rate of pay.

I can cite other examples, but I think that illustrates it.

Mr. HARRIS. I wonder what the likelihood is of getting the matter resolved or finding a solution?

Mr. MEISEL. Maybe I can best answer that by telling you where we stand precisely. We are committed at the moment to implement standards which the Commission has already issued starting the end of this month.

Those standards, if placed into effect as they are now published, will result in no upgrading of present controllers except for the assistants who are now in the centers. These are now grade 7's. They would be upgraded to grade 8. There would be no change in the controller grades. There would be some downgrading of controllers at the low activity approach control towers.

The proposals that are now under consideration would change that picture materially by providing for some substantial upgradings at the heaviest activity centers and towers.

The Commission, as I stated earlier, has indicated informally, and this is at a fairly low level in the Commission and is not the authoritative viewpoint of the Commission itself, that they will buy our proposals in principle as soon as we can work out the precise wording. If they buy that, within the next 2 weeks we have worked out a satisfactory solution for the moment.

Based on the last 2½ years of negotiations, I have no way of knowing whether we will have them resolved or not.

Mr. HARRIS. Well, it is unfortunate that during the course of these hearings we have run into this particular point that does not seem to be as encouraging as some of the other things are. Maybe we had better look into this a little further.

I do know, and everyone else knows, with all this technical equipment that you have, if you do not have the personnel to operate it, it is money foolishly spent. I think it is a sad commentary that we have not had as much encouragement in the field of personnel to carry out this program as we have had in the planning and programing of the other areas affecting this vital industry which is so important to our future.

Any further questions, gentlemen?

If there is nothing else, thank you very much.

Mr. MEISEL. Thank you.

Mr. HARRIS. We will see what else we can get on this particular point, Mr. Pyle, because I personally feel very good about the progress that has been made in the entire program as explained by Mr. Bakke yesterday and by you today. I am hopeful, and I believe we will see this progress continued, and I am sure the public will feel much better about it, too.

We thank you for your appearance here and your testimony, Mr. Pyle, and we are very glad to have the information.

Also, that goes for your associates.

I notice we have Mr. Gerald F. White here. He is Chief of your Enforcement and Litigation Section. Would he want to comment further?

Mr. PYLE. Mr. Chairman, I do not believe that Mr. White has any comment to offer at this time.

You did mention, Mr. Chairman, that possibly you would like some information on the airports, and Mr. Herbert H. Howell is prepared to answer any questions in that area, if you would like.

Mr. HARRIS. On the airports?

Mr. PYLE. He is the Director of our Office of Airports.

If there is any information we can furnish you in that area, we would be glad to do so.

Mr. HARRIS. I am glad you brought it to my attention because I intended to ask you about that.

What about the Washington National Airport?

Have you gotten a second airport started yet?

Mr. PYLE. That is a difficult question.

Specifically, we do own, I cannot remember the exact number of acres at the Burke site right at the moment, but we have not been successful in getting additional appropriations for a second Washington National Airport. We feel very strongly that one is required, and we would hope that as soon as we can, we will be authorized to

initiate further construction at this site or at any other site so that we can provide the city with the needed second airport.

Mr. HARRIS. What further consideration, if any, has been given to the utilization of Friendship Airport in conection with the program here?

Mr. PYLE. That is being worked on, sir. The Civil Aeronautics Board is investigating that possibility.

I would point out that that is only an interim solution because, in our humble opinion, Baltimore, by about 1961, will have sufficient traffic of its own to be operating at practically capacity. Therefore, this will only be interim and we have to provide something that will provide the Capital City of this country with adequate airport facilities, namely, a second airport.

Mr. HARRIS. Some of us had an invitation from the Baltimore committee, and from the mayor, who incidentally was a Member of Congress a number of years ago, to visit the Baltimore Airport, and we were quite impressed with the fine facilities that they have there—the equipment is modern and up to date—and the lack of use of such fine equipment.

The Government has put $4 million in it and Baltimore has put what, $10 million?

Mr. PYLE. I would have to get the information from Mr. Howell.

Mr. HOWELL. That is approximately right.

Mr. HARRIS. I understood they have put a total of about $14 million into it over the years, including the $4 million that the Government put in it. As I had it explained to me, it was contemplated at the time that that would be very likely used not only for domestic traffic of Baltimore in that area, but also in connection with our international traffic.

As I understand now, it is not being used for that purpose at all.

Mr. PYLE. I believe that is correct, Mr. Harris.

Mr. HARRIS. Do you not have a substantial amount of international traffic at the Washington Airport now?

Mr. PYLE. No, sir; not to my knowledge.

I do not believe there are any international operations now being conducted at the Washington National Airport.

Mr. HARRIS. There is a tremendous MATS operation there I believe.

Mr. PYLE. Those are international in nature. I was speaking of civil.

Mr. HARRIS. There are others that are using the upper, if it is the upper end. Why could not all of that traffic, since it is not a part of the scheduled operations, go to Baltimore?

Mr. PYLE. Well, in that connection we are working with the Air Force to see if we can work out some program to move some of their operations elsewhere, whether it would be Friendship or Andrews. They are, however, presented with some problems in that area and we have to resolve them.

I do not mean by my comment in any way to detract from the excellence of Friendship Airport, because it is, as you say, a very fine one and most adequate, but I would point out that right now they are averaging between 135,000 and 150,000 operations per annum up there, and as a result, it will not be long before they are operating practically at capacity.

Now, in fairness, some of those operations are local operations and training flights. They might well be transferred elsewhere. Nevertheless, the fact remains that in sheer numbers they have a very busy airport up there.

Mr. HARRIS. It was not very busy the day we were there.

Mr. PYLE. Not in terms of airline operations; that is quite true, Mr. Chairman.

Mr. HARRIS. Well, I did not want to utilize all the time on that, but it is a very, very important subject that I think should be gone into.

Mr. PYLE. The question of the use of Friendship is now being considered actively by the Civil Aeronautics Board and Secretary Weeks, the Secretary of Commerce, also recommended that in the interim until construction has been initiated, that Friendship must be considered as an alternative for the second airport as an interim problem.

Mr. HARRIS. It is the thinking of the CAA that relief has to be given at the Washington National Airport?

Mr. PYLE. Yes, sir; very definitely.

Mr. HARRIS. Now, on the airport program; if you desire Mr. Howell could speak on that.

Mr. PYLE. If you have any specific questions on the program, Mr. Chairman.

Mr. HARRIS. The one thing we are interested in is as to the progress being made on the program.

Mr. PYLE. Perhaps Mr. Howell could speak, then, on that point.

Mr. HOWELL. Mr. Chairman, I am Herbert H. Howell, Director of the Office of Airports for CAA.

Among our other functions, we do administer the Federal aid airport program. I presume that is the program you were referring to?

Mr. HARRIS. Yes.

A year ago we provided for a 4-year program and I am sure that that program is being carried out, and I thought you might bring us up to date on the progress being made.

Mr. HOWELL. Mr. Chairman, that amendment to the Federal Airport Act was Public Law 211 which the Congress passed and was approved last August 10, I believe.

Mr. HARRIS. A year ago?

Mr. HOWELL. Yes, sir.

Essentially, the changes that that amendment made in the Federal aid airport program were as follows:

First, it took the program from an annual appropriation basis and set it up on an authorization basis covering fiscal years 1956 through 1959, making a total of approximately $63 million available during each of those years.

It also reaffirmed the eligibility of terminal buildings and small airports.

Immediately upon passage of the act, a working group was set up with some industry representation to review all of the policies and procedures under which the program had been operated in its early years, and within a space of about 12 weeks, which set some sort of record, I think, for governmental procedures; we did have all of the details of the new program out to sponsors and the initial allocation of funds was made in February of this year.

We followed in May of this year the allocations for fiscal year 1957 and we would hope around the first of January 1957 to announce the allocations under fiscal year 1958.

While obligations cannot be made until the fiscal year for which the authorizations are made, it still gives sponsors advance notice of the amount of funds that they will receive and is of considerable assistance to those sponsors during the advance planning to get the projects in operation.

I would say that reception of the program has been most enthusiastic; in fact, our applications from sponsors have each year been at least double the amount of funds that we had to allocate, which has forced us to be quite restrictive in the criteria that we use to choose the projects on which the money is to be expended.

Mr. HARRIS. A good many people have been quite concerned about the lack of space, runways, and so forth, to meet the jet traffic which is contemplated in 1959 and 1960.

What is being done by sponsors of these programs and CAA to meet that problem?

Mr. HOWELL. First, with regard to CAA, we have under extensive review all of our standards and criteria that apply to airport location and dimensions. We have what we call our jet age planning team that is working with the industry, and particularly the manufacturing industry, to find out the specific requirements of jet aircraft that are now on order.

We have had two very beneficial meetings with the Boeing people, who have a prototype jet air carrier plane already in operation, and further meetings which involve specific flight tests are yet to be held with Boeing. We hope to enter into similar discussions with the other manufacturers of jet aircraft.

Boeing was not selected for these discussions because of any preference but because they actually have the prototype flying.

The discussions have revealed that in some respects it is just another airplane, although it does involve turbine engines. The specific requirements can be worked out far enough in advance of the actual operation of the airplane.

I am confident that the airports will be ready to accommodate the aircraft when they are placed in operation.

Mr. HARRIS. Is it true that presently only about five civil airports in the country can accommodate jets?

Mr. HOWELL. I cannot give you the exact number that could handle jet aircraft at full gross weight, Mr. Chairman, but, as in all transport aircraft, the airplane will be a flexible airplane. In other words, the amount of airport it is going to need will depend to a large degree on the type of flight that the airplane is used for. It is going to take more runway for a jet aircraft to take off from the east coast for a nonstop flight to the west coast than it will for a flight from that same point, say, to Cincinnati, or to St. Louis or to Chicago, because of the considerably lesser amount of fuel required, and, consequently, the lesser weight involved in takeoff.

We have, on the basis of preliminary information furnished to us by the manufacturers, made some analyses and find that, on the basis of present runway lengths that are available, the jet airplane could reasonably be expected to fit into the present type of flight operation.

The airplane will take long runways, it appears, for extremely long distance flights, particularly your nonstop overseas flights.

Mr. HARRIS. How long a runway does it take?

Mr. HOWELL. Really, sir, at this moment, to pull figures out of the air, I should say the airplane on short haul can operate satisfactorily at the average airport with 6,500 feet, up to 10,000 feet for a long, nonstop, overseas flight.

Mr. DOLLIVER. Is that takeoff or landing, or both?

Mr. HOWELL. Takeoff.

Mr. WILLIAMS. You need longer approaches for that type aircraft, do you not.

Mr. HOWELL. Not to our knowledge, as yet. You mean flatter approach clearance?

Mr. WILLIAMS. Yes, sir.

Mr. HOWELL. No, sir. It appears that it will handle just like any other airplane except perhaps faster speed, but the approach angle would be comparable to piston aircraft.

I say that subject to correction, because I am not any expert at all on the flight operational characteristics of the airplane.

Mr. HARRIS. Is there anything further?

Thank you very much, Mr. Howell.

Mr. HOWELL. Yes, sir.

Mr. HARRIS. And thank you, Mr. Pyle. Is there anything else now?

Mr. PYLE. I would like to express on behalf of myself and the agency our appreciation for the opportunities to present our story here, and if there is anything further that we can ever furnish you, we are certainly ready and willing to do so.

Mr. HARRIS. Thank you very much. You have been very helpful.

We have Mr. Stuart M. Speiser. I believe you are chairman of the aviation law committee of the National Association of Claimants' Compensation Attorneys.

STATEMENT OF STUART M. SPEISER, CHAIRMAN, AVIATION LAW COMMITTEE, NATIONAL ASSOCIATION OF CLAIMANTS' COMPENSATION ATTORNEYS

Mr. SPEISER. That is correct, sir.

Mr. HARRIS. I understand that you are from New York and were to return today.

Mr. SPEISER. Yes, sir.

Mr. HARRIS. Do we have someone else here from out of the city who is to testify?

What is your name?

Mr. SUMMERS. Fred Summers, sir.

Mr. HARRIS. I have you as "Washington" here. You live somewhere else, do you?

Mr. SUMMERS. Yes, sir.

Mr. HARRIS. We will try to get to you this afternoon, too.

Mr. Speiser, you may proceed.

Mr. SPEISER. Thank you, Mr. Chairman and members of the committee.

By way of identification, the National Association of Claimants' Compensation Attorneys is a national bar association composed of

more than 5,000 attorneys in all 48 States. We have members in this Congress, both in the House and the Senate, and a number of governors of the various States and former governors are members, as well as former judges and prominent members of the bar throughout the country.

We do our best to represent the interests of the traveling public as they are affected by aviation matters.

My purpose in testifying today is to call to the attention of the Congress some deficiencies in the accident investigation policies of the Civil Aeronautics Board which result in the failure of the CAB to secure, in the form of a public record, all known facts pertaining to the causes of plane crashes as required by the Civil Air Regulations.

Obviously, this failure to secure all known facts in a public record can have a serious effect on air safety. It can and does also have a serious effect on the legal rights of the victims of these plane crashes, the families of the deceased passengers.

I should point out parenthetically that when someone is killed in an airplane crash, the family has a right to sue for damages under law, as provided by the laws of the various States, and that claimant has to prove his case just as if it was an automobile case.

They have to prove just all the facts and circumstances surrounding the crash, and reach a conclusion one way or the other as to whether the airline is liable. I should point out also that we cannot use any reports of the Civil Aeronautics Board in civil litigation. We must prove the case by means of witnesses just as you would prove an automobile case, as I mentioned.

Mr. DOLLIVER. May I interject a question at that point?

Mr. HARRIS. Mr. Dolliver?

Mr. DOLLIVER. Do I understand that you are referring now to claims against civil aviation companies that act as common carriers?

Mr. SPEISER. Yes, sir.

Mr. DOLLIVER. Isn't there a rule in some States that there is a presumption of liability on a common carrier when an accident occurs resulting in death?

Mr. SPEISER. No, sir. There are different rules of law in various States, but generally speaking, we have to prove that there was negligence on the part of the airline or the claimants won't collect any money. That is generally the rule in all of the States that I have been familiar with, and I have dealt with the laws of a number of these States as chairman of this committee.

Mr. DOLLIVER. Thank you.

Mr. SPEISER. In the investigation of airline crashes, the CAB has adopted a seemingly effective policy of appointing various specialized groups to inquire into different phases of the disaster involved. There may be a powerplant group, structures group, air traffic control group, et cetera.

The group chairman is usually a CAB investigator. Usually the other members of the group are selected from the personnel of the airlines involved, and possibly from the manufacturer of the equipment involved.

Therefore, in the typical CAB airline accident investigation, the airlines involved in the crash, or the airlines, if it happens to be a collision, have their own representatives present for an on-the-spot investigation. Even though the CAB maintains control over the

wreckage during the investigation, the airlines have access to it through their employees on the investigating groups.

On the other hand, the victims of the disaster have no representatives on these investigating committees, and have no access to the firsthand facts which can be developed only by on-the-scene investigation.

We find no basic fault with this situation, since the CAB has found it helpful to have airline employees assist in these investigations, and since it is obviously impossible for victims' attorneys to be present during the investigation, due to the fact that they usually are not retained until weeks or months after the disaster.

We do feel, however, that this situation makes it imperative that the CAB protect the public interest by requiring all airline personnel who had access to the evidence to disclose their findings as part of the public record required in all accident investigations.

To do otherwise would result in giving one party, the airlines that is, access to evidence, and shutting the door to the other party merely because the latter happens to be more concerned at the moment with the process of burying the dead than that of hiring a lawyer.

It may also have a serious effect on the safety of airline operations and airspace use, as may any policy which favors the withholding rather than the public disclosure of accident investigation information.

I have indicated in my written statement here by way of example how the important phases of the Grand Canyon accident investigation were handled to show just how unjust the present situation is.

Possibly the most vital phase of the CAB investigation into the Grand Canyon disaster was the determination that a collision had occurred between the two planes involved.

This phase was handled by a specially appointed structures group. In the words of this group's report—exhibit No. 11–A at the CAB public hearing—"The chief purpose of this group was to determine if a collision had occurred between the two aircraft." Of course, as we all know, they did reach the conclusion that a collision occurred.

This may seem very elementary to you gentlemen, but I should point out as a point of law nobody assumes a collision occurred, and we must prove a collision, and the fact that it appears in the newspapers and everybody is calling it the Grand Canyon accident doesn't mean a darn thing as far as the law is concerned.

The chairman of the structures group was Martyn V. Clarke, an employee of the Civil Aeronautics Board. There were 13 other members of this committee, of which 2 others were CAB employees, 1 a CAA employee, 5 employees of Trans World Airlines, 4 employees of United Air Lines, and 1 employee of Lockheed Aircraft Corp., the manufacturer, so that out of 14 on this structures group, 9 were airline men.

This report, which was made part of the public record of the CAB, the structures group report, was signed only by Mr. Clarke, the chairman of the group.

At the public hearing, which was held here in Washington, Mr. Clarke testified at length concerning his report and he gave all the details showing how they had arrived at the decision that a collision had occurred.

Two other members of the structures group were called to testify at the public hearing. One was a TWA employee and the other was a

United Air Lines employee, but neither of these airline employees was asked if he agreed or disagreed with the vital portions of this report dealing with the happening of a collision, and none of the other members of the structures group was called as a witness at the public hearing, so that their views on the question of a collision presumably are unknown to the CAB.

Of course, you gentlemen may feel it is not very important that they ask these other men whether there was a collision, because everybody knows that there was a collision, but I am pointing out the situation because there are many accidents in which the facts are not so clear.

There may not have been a collision. They may find a plane out in the wilderness somewhere and make out a mass of records, and if it doesn't get into the public record, that can have a very serious effect on airline safety.

This handling of the structures group follows a pattern which the CAB has established in recent years. They appoint a group or committee of qualified men from various branches of aviation to investigate and report on various phases of the accident. The entire group has access to the records of the other matters under investigation, but the report is only signed by the chairman, who is invariably a CAB employee, and if the CAB calls any airline member of the committee as witnesses, they usually simply ask him: "Have you read the report and do you have any comments to make?"

And invariably, the answer is that they have read the report and they have no comment on it at this time. As I point out in my statement, that might be a satisfactory answer for a movie star to give to reporters inquiring about rumors of an impending marriage, but I don't think it is a very satisfactory form of questioning to be used in a proceeding where the Board is charged with the duty of establishing the cause of a disaster which claimed the lives of 128 passengers.

This situation leaves the CAB without knowledge as to whether these aviation experts agree or disagree with the factual findings and conclusions contained in the report. Therefore, this pattern of handling group reports obstructs the CAB in its statutory functions of finding the facts, determining probable cause, and preventing future accidents.

Without a full airing of the views of all the group members, the CAB cannot discharge this vital duty.

It may be that some of the airline members of the Grand Canyon structures group do not agree that a collision occurred. If so, it is vital to the public interest that they come forward and give testimony under oath as to the facts and probable cause of this disaster.

Also, I might say that the structures group report deals not only with the happening of a collision, but the manner in which it happened, the angle of collision, whether one plane came up and hit the other from below, or from the side.

All these things can have an effect on what the regulations should be and the practices should be in air traffic control, and some of these airline men may not agree, for example, that the propeller nicked the fuselage at a certain angle, and so on.

Incidentally, the structures group report was compiled from joint notes made by a number of men. It wasn't just Mr. Clarke's findings.

That is indicated at page 311 of the public record of the CAB hearing, where the question was asked:

> That report was taken from notes that you gentlemen had accumulated among yourselves?
> Answer. That is correct.

In other words, we are dealing here with the findings of a number of men, and I think that all 14 of these men should indicate just what they agree with in this report and what they don't agree with.

I pointed out the possible detrimental effects to air safety in this policy. We also, as claimants' attorneys, are concerned with something that may be equally serious, and that is the wtihholding of this information and this evidence from claimants.

We, as claimants' attorneys, have no access to these records and I should point out that when anybody goes into the Grand Canyon or any other place and goes to look at wreckage or any other part of the airplane, the factual findings and the observations that he makes and the conclusions and opinions that he reaches are evidence, and under the laws of this country that evidence is available to anybody.

In other words, the fact that he works for an airline does not make that the airline's evidence. He is not the airline's witness. He is a witness in the cause of justice if he is called by the courts, and he is a witness in the field of air safety if he is subpenaed by the CAB, and he must disclose that information.

There is no privilege and no other right to hold back that information. In the proving of these cases, as I pointed out, we must prove that a collision occurred, and we cannot use the CAB's conclusions on that point. It requires the testimony of qualified persons who examine the records and who can state that a collision did occur based on their studies of the wreckage.

It is not likely that TWA or United will admit there was a collision when asked to do so by lawyers representing the victims. It is just not their policy. The lawyers don't have to admit anything in the litigation. It is up to us to prove it.

Therefore, the first thing that many victims' attorneys will do is to take the deposition of Mr. Clarke, the CAB employee who headed the structures group. They will then seek to have Mr. Clarke repeat the statements made in the group report and in the testimony he gave at the CAB public hearing—which, of course, cannot itself be used in court—establishing that a collision did occur.

This attempt may be met by an objection on the part of the airlines' attorneys, that Mr. Clarke is merely giving his opinion as an expert; and that under section 311.3 of the Civil Air Regulations—14 C. F. R. 311.3—employees of the CAB are prohibited from giving opinion testimony in litigation pertaining to air crashes they have investigated.

Mr. Clarke may then find himself a storm center in possibly 128 different cases, and much of his time may be taken up with depositions and subpenaes to appear in court. This may well further impede the CAB's vital accident investigation efforts in other crashes.

Several years ago a CAB attorney asked me how the Board could avoid this waste of the precious time of its investigators. I believe that the Board then had only about 14 expert investigators to cover the entire country.

I suggested to the CAB attorney that if the Board would require the airline members of the investigating groups to sign the group reports, we attorneys would not have to bother the CAB investigators in these cases, since we would be able to develop the evidence through the other members of the investigating groups, and I might mention this also pertains to the CAA.

We have had to take men out of control towers—and we have heard personnel problems mentioned here today—and we have had today CAA men off their jobs to sit around the courthouse to act as witnesses because the airline men were not available under the same circumstances.

If the victims' attorneys find themselves blocked in section 311.3 of the Civil Air Regulations, they may then turn to the airline members of the structures group, in an effort to establish the collision through these witnesses. In taking the depositions of these airline members of the structures group, the victims' attorneys may well find that these witnesses at that time will not agree with the group report on the question of the happening of the collision. We have had that happen 2 and 3 years after an accident; that is, an airline man who is a member of a group may come into court and he may take a position which is entirely opposite from that of the report.

Yet he never said anything to the CAB about it and the CAB never asked him anything about it except to ask him if he had any comments at that time and, of course, he had no comments.

Legally, there is nothing to prevent him from doing that if he has not signed the report or he hasn't testified before the CAB in the first place. Also, of course, they sometimes come forward with testimony and evidence that has never been disclosed to the CAB and the victims' attorneys have never had any chance to investigate.

As a suggested remedy, I believe that there should be a regulation or a practice that all members of these investigating groups sign a statement at the end of the group report to the effect that they have read the foregoing report and agree with it in all its deails, or if they read the foregoing report and agree with it in all its details, or if they don't agree with it, let them set forth exactly what they don't agree with and set forth all other findings that they may have made that are not contained in the report.

I believe that this would serve the public interest in aviation by first of all making available to the CAB the views of all these aviation experts to guide the Board in its factfinding and determination of cause, and by relieving the CAB employees of much of the time-consuming burden of testifying in civil litigation and by making available to the victims' attorneys evidence found by airline employees during the investigation.

This last point that I mentioned will go some of the way toward evening the scales of justice, which are thrown out of balance by the fact that the airline employees investigate the crash immediately and have access to all the evidence at the very time of the crash, whereas the victims' attorneys usually are not even retained for several weeks or months after the crash and have no opportunity for on-the-spot investigation.

I might say also that we are not seeking to have the CAB try any lawsuits for us or point its finger at anybody. We merely feel that

all the facts should be brought out, and the CAB has a statutory duty to do that and under their present procedures they are not doing so.

This procedure of having the airline men sign the reports or testify to the agreement in the reports may be opposed by the airlines or insurance companies on the ground that they would be putting group members on the spot, and we might even hear some suggestions that if they had to sign these reports they wouldn't serve on these groups.

I think it should be remembered that the CAB has the duty to find the causes of these accidents and make proper rules for their future prevention. The CAB has the power of subpena, and can enforce any degree of cooperation required.

Anyway, it is ridiculous to suppose that the airlines would not want to cooperate fully in these investigations. They want to get at the causes and they want to prevent them as much as anybody else does, if not more so.

We feel if the CAB gives the airlines access to the wreckage and other evidence at the time of the crash, and appoints airline employees to the investigating groups, there is no possible excuse for not requiring these airline group members to sign the report and state any differences they may find with the report.

Otherwise the CAB will be creating a right to withhold evidence and obstruct justice, as well as obstructing air safety and the safety of airspace use.

It is not a satisfactory answer to the victims of these disasters that their attorneys may have an opportunity to inspect the wreckage weeks or months later, after it has been removed from the crash site. Such an inspection of jumbled parts in a warehouse is certainly no substitute for an on-the-spot view of the entire wreckage scene, which the airline employees are afforded.

In order to correct this abuse in the Grand Canyon investigation, which is the subject of this inquiry, I respectfully submit that it will be necessary to call as witnesses the men whose names I have listed on page 9 of my statement, or in the alternative, to have them submit a written statement as to whether they agree or disagree with the structures group report.

All of these men were members of the structures group. They have all received copies of the report in advance. That is pointed out on page 304 of the CAB minutes, that all these members were given copies of the report, and none of them have expressed their agreement or disagreement with the group report or finding that a collision occurred.

In other words, we just don't have the benefits of their views.

Mr. WILLIAMS. Will you yield at that point?

Mr. SPEISER. Yes, sir.

Mr. WILLIAMS. In your statement you say that "rectification of this shocking situation requires that this committee or the CAB call the following persons as witnesses." What purpose would be served by this committee calling these people as witnesses?

Mr. SPEISER. This committee, I take it, is interested in the regulations that now exist for the prevention of these accidents. I take it that is one of the purposes of this committee's injuiry and I think that it is important that this committee and everyone else connected with the inquiry learn just what the views are of these men.

There may be some of these men who don't agree with the findings of the structures group and they don't agree with the angle of collision or points like that which you gentlemen are going to have to pass on later on.

Mr. HALE. Will the gentleman yield?

Mr. WILLIAMS. Surely.

Mr. HALE. If this committee took any such step as that, wouldn't we be simply using the committee as a tool to help people in private litigation?

Mr. SPEISER. I don't believe so, sir. You would be doing that. I don't deny that. You would be helping people in private litigation, but only indirectly, and only so far as the law provides.

In other words, all these men whom I have mentioned here have the duty of coming forward and giving whatever evidence they found in the Grand Canyon. That has not been done by the CAB, which has a statutory duty.

Mr. HALE. There is nothing in the rules of the House that says the committee is to assist litigants in cases arising out of airline crashes.

Mr. SPEISER. I don't suggest that at all. I suggest that this committee is interested in whether or not the Civil Aeronautics Board is securing in the form of a public record all known facts pertaining to this crash.

As nine men who were in the Grand Canyon and looked at this wreckage and have not come forward to say what they found, does the committee feel that the Board is securing in the form of a public record all the known facts?

There are many facts that may be known by these men that are not in the public record, even though you gentlemen may know them, and others who were on the scene and are familiar with them. We have the requirements that the CAB secure these facts in the form of a public record, and I say it has not been done in this case, and in a number of other cases which I could point out to the committee if there is any challenge on that issue.

I do not wish to suggest that this committee be used as a means of helping any claimants or anything else. I say that this committee, I assume, is interested in whether the Civil Aeronautics Board is carrying out its statutory duties to find the cause of these crashes by means of developing in a public record all known facts discovered by anybody who has access to the wreckage and to the other investigation procedures.

Of course, I appear here as an attorney for claimants, and that is the motivating interest and the thing that got me interested in this thing, but I think it is a patent injustice when the Government appoints people to go into the Grand Canyon and they have access to the evidence and they are not called on to come forward when the law requires them to come forward and give whatever evidence they have as to the cause of this crash and any facts that they have discovered.

I did want to point out another breakdown in the CAB's accident-investigation report which can affect the Grand Canyon investigation and future investigations. I may be wrong, but I feel this committee has an interest in whether the CAB is doing their job properly in all these accident investigations, whether they are getting to the bottom

of the causes of these things, so that they will be prevented, and I have reference to their policy on the handing up of questions from the audience.

They have a regulation under which those in the audience at public hearings into accident investigations can hand up questions, and they have no provision for putting these questions in the record. So that when a hearing officer, who is usually a lawyer and has no technical background necessarily in this field, may reject questions as not being pertinent, as I point out in my statement, I feel that at the very least the questions submitted should be put in the record so that the CAB and others who follow up on the investigation will at least have the benefit of the questions, if not the answers.

This, again, is another policy which seems more designed to withhold than to disclose accident-investigation information. I don't think there can be anything more important in the field of air safety than the full disclosure of all facts found in an accident investigation.

I do want to thank the committee for the opportunity to testify here today, and I will be glad to answer any other questions that you may have.

Mr. HARRIS. Thank you very much, Mr. Speiser, for calling to the attention of the committee this very important problem.

Are there any questions, Mr. Williams?

Mr. WILLIAMS. No; I have no questions.

Mr. HARRIS. Mr. Hale?

Mr. HALE. Have any suits been instituted as yet by the personal representatives of the passengers?

Mr. SPEISER. Yes, sir; I believe so.

Mr. HALE. Several suits have already been instituted?

Mr. SPEISER. Yes, sir.

Mr. HALE. Has any suit been brought by United against TWA or vice versa?

Mr. SPEISER. That I don't know. I think the question of the hull damage is a question of arbitration rather than legal proceeding, but I am not sure of that. However, I do know there probably will be a lot of claimants' suits on these things. There are a lot of lawyers and other people who think these cases are settled very easily, but they are not.

Mr. HALE. You said something about arbitration. I am not sure of your answer.

Mr. SPEISER. I don't want to speak as an expert on that. It is just my understanding as between the two airlines, for example, if United were to sue TWA for the value of its hull, for the value of the DC–7 which was lost in the crash. I believe that that would be a matter submitted to arbitration.

I think they have some kind of an agreement where they arbitrate those things.

Mr. HALE. Under existing agreements between airlines, disputes of that kind can be arbitrated?

Mr. SPEISER. I am not positive, but that is my impression. Whether it is an agreement or just what form it takes, I don't know, but it is my impression it is a subject of arbitration.

Mr. HALE. I don't see how, as a practical matter, the attorney for a passenger's estate can prove a collision.

Mr. SPEISER. It is very difficult, but we don't have to prove it, of course, by eyewitnesses. We can prove it by competent legal evidence, which consists of an expert or a man who knows structures going in and taking a look at the structures, and if he says there is a propeller nick from a DC–7 in the fuselage of this Constellation, or he says there is paint from United on a TWA plane, and they are both together, this is competent evidence from which the court and jury may conclude a collision.

Mr. HALE. In this case some paint off one plane was found on the wreckage of the other, or something of that kind?

Mr. SPEISER. Yes, sir; we have to prove that in court.

Mr. HALE. And that is some evidence, if you can subpena the man who found the paint on the other plane.

Mr. SPEISER. That is just it.

Mr. HALE. In many cases, or it is quite conceivable at least, planes could collide without any evidence whatever of collision being established through paint or otherwise.

Mr. SPEISER. That is exactly right. That is why we are so insistent on getting the evidence that is developed by these airline men who have access to the records when we have no opportunity to see that wreckage in the Grand Canyon, and with respect to these people, as I say, because they are employed by the airlines, that doesn't mean that it is the airline's evidence or that they are airline witnesses.

Under the laws of this country, anybody who has any facts is a witness for the court for the cause of justice, and he can be brought forward.

Mr. HALE. Yes; but suppose this committee called the witnesses you enumerated on page 9, and all of the witnesses had expressed agreement with the findings of the structures group? Would that be admissible in evidence in a civil suit by a personal representative of a passenger?

Mr. SPEISER. Not in that form, but we would be able to call any of these witnesses and ask them if they agreed, and then if they didn't agree, we could confront them with a statement under oath made before this committee to the contrary.

Mr. HALE. That doesn't prove a collision.

Mr. SPEISER. That is competent evidence of a collision.

Mr. HALE. It proves that Harold Carr, for example, thinks there was a collision.

Mr. SPEISER. That is enough for the jury to pass on. In other words, the jury may, even if they hear Harold Carr, decide there was no collision. We can't prove it conclusively physically, but if the jury has enough facts to reach that conclusion, then we have made out a prima facie case.

However, without Harold Carr, the case would be thrown out. It won't even be considered by the jury. The judge will dismiss the case saying, "You have not put forth any evidence from which the jury can conclude there was a collision," and that has happened in some of these suits.

Mr. HALE. It is a long time since I tried a tort case, but I would suppose that the evidence of a dozen people who had reached the conclusion that there was a collision wouldn't be evidence that you could submit to the jury in the absence of some physical evidence of a collision or some evidence that somebody had seen a collision.

Mr. SPEISER. That is it. These dozen men have seen the wreckage. They have seen the wreckage together. They have seen how it came together and the various marks it left, and they are the only ones who can say there was a collision, and that is why we need their testimony and why the CAB needs it.

Mr. HALE. Assume that you are attorney for the personal representative of a deceased passenger. Certainly you can subpena witnesses who examined the wreckage and then, in that way, you may elicit evidence that would be persuasive to the jury, but I don't see but that you have to take that course.

Mr. SPEISER. We have to take that chance.

Mr. HALE. I agree. It is awfully tough.

Mr. SPEISER. We can't subpena the CAB chairman of the committee into court. They have a policy that they will not answer subpenas in the court on these matters, and I don't believe they should be involved in civil litigation.

Mr. Clarke's job is to investigate accidents and he might spend the better part of his year in court.

Mr. HALE. Suppose an employee of the CAB, or a member of the CAB, for that matter, gets out to the scene of the crash and does, in fact, investigate the wreckage. Certainly I wouldn't suppose that the employee of the CAB had any immunity from being a witness in a civil proceeding and I don't know that a member of the CAB would. I don't know what the law is on that.

Mr. SPEISER. It has never been tested, but they do have a policy, and a regulation, I believe, that they will not respond to subpena, that they will give testimony by deposition, and only as to facts, not as to opinions or conclusions.

Mr. HALE. Members of the CAB, or employees, are you speaking of?

Mr. SPEISER. Employees. I don't know about members, but, of course, they very rarely, as far as I know, get to the scene of the wreckage before the investigators do, if at all.

Mr. WILLIAMS. Will you yield at that point, Mr. Hale?

Mr. HALE. I am through.

Mr. WILLIAMS. Mr. Speiser, that may or may not be pertinent to the point that you want to get across, because it deals with a specific case, but do you have reason to believe that any of the members of this structures group who were connected with this Grand Canyon investigation might take exception to all or any part of the report?

Mr. SPEISER. I have no reason to believe one way or the other, because I don't know the gentlemen, but I can tell you from past experience with a number of these cases that we have had situations where airline members of a group have come into court 2 and 3 and 4 years later and they have on the one hand gone full-scale opposite to the position of the report.

They have taken an opposite position and not agreed with it, or they have come in with new facts which were not treated at all by the committee and constructed an entirely new theory of an accident.

For example, to take a specific example I can give you, we had a crash in Elizabeth, N. J., a few years ago at the Newark Airport in which there was a propeller reversal and everybody in the aviation industry felt there was a propeller reversal and it was assumed that that was the cause of the crash, and there were all kinds of investigations on it.

When the trial of these cases came up, suddenly somebody appeared who took the position there was no propeller reversal, and that has happened. It would be akin to someone coming forward in this case and saying there was no collision; that the two planes disintegrated in air.

Of course, that is a little ridiculous in this case, but legally we have to get by a judge on these things. Even a judge and a jury may know there was a collision and may call it the Grand Canyon collision, but unless we can prove it, we are out the window.

I think when we talk about the public interest in air transportation, we are, after all, talking about the passengers and some of those who didn't get a safe ride, and their widows have to sue to replace the support they have been deprived of because of the accident.

Mr. HARRIS. Do you have some questions?

Mr. DOLLIVER. Yes.

You say several suits have been brought. Do you know how many?

Mr. SPEISER. I don't know how many, but I am inclined to think that most of these passengers' families will have to sue because of the fact that there are two airlines involved, and they will be fighting over who is responsible and there won't be even the normal number of settlements.

I wouldn't be surprised if all of these passengers' families had to sue because I don't know that either the United or TWA will admit any share of responsibility which is involved in a mid-air collision.

Mr. DOLLIVER. Do you know whether they carry insurance?

Mr. SPEISER. Yes, they do.

Mr. DOLLIVER. They are fully insured; are they not?

Mr. SPEISER. Yes, the lines are insured.

Mr. DOLLIVER. Where are these suits pending that you know of, and in what form?

Mr. SPEISER. I happen to represent one of the people. I haven't filed a suit yet, but I think that will be filed next week and I know of a couple in California that one attorney is filing, but generally speaking, as you know, a death in the family, a violent death, disrupts the family in such a way that sometimes these people don't get around to hiring a lawyer for 6 months or a year.

Mr. DOLLIVER. Where were these suits filed? In what form?

Mr. SPEISER. You mean what court?

Mr. DOLLIVER. Yes.

Mr. SPEISER. I believe in Los Angeles. I don't know whether it is United States District Court for Los Angeles or whether it is the State court, but I am filing one myself in the United States District Court of New York.

Mr. DOLLIVER. New York?

Mr. SPEISER. Yes.

Mr. HALE. You can bring suit anywhere you can get jurisdiction of the defendant?

Mr. SPEISER. Yes. And usually that is where the decedent family lived or the nearest place to it.

Of course, in this case you would have to get jurisdiction of both airlines.

Mr. DOLLIVER. How do you make out a prima facie case if you have to prove the collision? How are you going to prove that any indi-

vidual was on what plane without going to the defendant himself?

Mr. SPEISER. That is it. In all these cases we have to prove everything through the defendant himself. It is unlike the automobile case where your own plaintiff is the driver and he can say he stopped at the light or didn't stop at the light, and so on.

The entire case must be proved through the defendant, and the defendant has access to the wreckage and we don't. Therefore, since they are witnesses not for the airline, but for the court, that is the main point of my argument: that they must be brought forward to give this evidence.

Mr. DOLLIVER. The courts may require them to come forward with their records, do they not?

Mr. SPEISER. Yes, they do, but unless they sign the report we can't take a chance, and put them on the stand and have them say that there was no collision.

Mr. DOLLIVER. You sometimes have to take some chances with your witness.

Mr. SPEISER. Yes, sir, but when you are dealing with a widow whose sole support depends the rest of her life on the lawsuit, you try not to take those chances, especially when these men have been in the Grand Canyon and they know darn well there was a collision.

Mr. DOLLIVER. It occurs to me that your problem is one of procedure in court, rather than procedure before this committee. What I am trying to say is that this is not the Judiciary Committee of the House, and we have no legislative jurisdiction over court procedures.

Mr. SPEISER. I realize that is one phase of it that strikes you that way, and that certainly is true, but what I am trying to bring out from the public standpoint is how can these men be allowed to withhold this evidence from the CAB, which has to find all the facts and draw its conclusions as to what happened?

Mr. DOLLIVER. It strikes me you are undertaking to pervert the purpose of the investigation of the Civil Aeronautics Board to something else than was intended.

My understanding is that the intention of the investigation by the Civil Aeronautics Board is to promote air safety and determine the cause of an air accident, not for the purpose of taking sides in any private litigation.

If there is something wrong with the court rules as to what testimony can be obtained, or what is permissible, that is an entirely different function than is carried out by the Civil Aeronautics investigation.

Mr. SPEISER. I am referring to the requirement in the Civil Air Regulations that the Civil Aeronautics Board secure in the form of a public record all known facts pertaining to the cause of the crash.

Without regard to what use is made of that, whether it is used by the Board or whether it is used by somebody else, by a litigant who can't get the information any other way—that is only incidental—I brought this problem up to show the problem we have, but the CAB has an obligation to secure the facts and put them in the public record.

Mr. HARRIS. Your real problem, if the gentleman will permit, is that you want the same man who makes the determination today to

have the same feeling about it 2 or 3 years from now when he comes before the court.

Mr. SPEISER. Yes, sir, and I think that is part of our process of justice.

Mr. DOLLIVER. Thank you very much.

Mr. HARRIS. Mr. Hale?

Mr. HALE. Maybe what you want is an amendment to the Civil Aeronautics Act which would say that a report of the Civil Aeronautics Board of an investigation of an air accident or disaster would be admissible in evidence on the part of a plaintiff in a proceeding for damages.

If any legislation of that kind should be proposed, it would not come to this committee, but as Mr. Dolliver pointed out, to the Judiciary Committee.

Mr. SPEISER. Yes, sir.

Mr. HALE. I have the utmost sympathy for anybody who represents the estate of a passenger because I can see that his evidentiary difficulties are terrific.

Mr. SPEISER. I think the fact that I happen to be a lawyer has probably diverted attention from another phase of this thing that is very important.

Suppose, sir, that a member of the structures group was called by the CAB and called as a witness, and someone in the audience handed up a question saying: "Have you read the structures report and do you agree with it?" Suppose that that question was discarded.

Would you say that under those circumstances the Civil Aeronautics Board has secured in the form of a public record all known facts pertaining to the crash, because that is what happened in this CAB investigation?

In other words, I am not referring now to the possibility of your committee calling witnesses or your committee investigating this thing; but was this a proper investigation by the CAB as has gone before us? Was it proper for them to rule out the question once the witness was on the stand, a man who had been in the Grand Canyon?

Was it proper to ward off a question in which he was asked whether he agreed with that report, and does that tend to develop all the facts which are necessary for air safety?

As I say, you gentlemen, I think, are impressed by the fact that everybody knows there was a collision and you are not going to learn anything from those nine men, possibly. You might learn something important. I don't know.

However, there are many other incidents in which the causes are obscure. You don't have a collision. You just find a plane somewhere. If these men don't come forward, I think it can be very serious for air safety, if they are not called forward, and I think that is what the committee should concentrate on, rather than the plight of the claimants which I happen to typify here today.

Mr. HARRIS. Thank you very much, Mr. Speiser.

Mr. Fred Summers.

Mr. Summers, you live in New York; do you not?

STATEMENT OF FRED SUMMERS, AIR TRANSPORT DIVISION, TRANSPORT WORKERS UNION, AFL–CIO

Mr. SUMMERS. Correct, sir.

Mr. HARRIS. Your address is included with your statement?

Mr. SUMMERS. My personal address is not included in the statement. I live in Freeport, N. Y.

Mr. HARRIS. You represent the Transport Workers Union?

Mr. SUMMERS. That is correct, sir.

Mr. HARRIS. And the address of the union is 80–07 Broadway, Elmhurst, N. Y.?

Mr. SUMMERS. Yes, sir.

Mr. HARRIS. Very well, sir. You may proceed.

Mr. WILLIAMS. Before you get started, Mr. Summers, may I ask you what makes up the air transport division of the Transport Workers Union? Is it a division of aircraft workers, or is it confined to the people who fly the airplanes, or just who makes up that group?

Mr. SUMMERS. The air transport division is composed of various groups. They are composed of navigators of Northwest Airlines, United, Trans World Airlines, Seaboard and Western, and the Flying Tigers, et cetera, and they also are composed of the purchasers and hostesses of Pan American and the mechanics for American Air Lines, and so on.

Mr. WILLIAMS. Does this have any connection at all with the ALPA?

Mr. SUMMERS. No, sir.

Mr. WILLIAMS. No connection at all?

Mr. SUMMERS. No connection.

Mr. WILLIAMS. Thank you, sir.

Mr. SUMMERS. Before I start my statement, I would like to say that I am employed by Trans World Airlines as a navigator. I have been employed for 14 years and this statement I am going to bring before the committee is a result of a study by the International Navigators Council, which is composed of about 950 navigators all over the world in which they are pursuing a study of air-traffic control for ICAO, so with that statement, I would like to proceed with my official statement.

It is the intent here to point out the weaknesses in the present traffic-control system as specifically applied to long-range flights, weaknesses which contributed to the tragedy over the Grand Canyon.

Therefore, I, Fred Summers, president of local No. 520, on behalf of James F. Horst, international vice president and director, Air Transport Division of the Transport Workers Union of America, CIO–AFL, and the Airline Navigators Council of the Air Transport Division present the following study and recommendations for the consideration of the honorable members of the House Interstate and Foreign Commerce Subcommittee on Tranportation and Communications on Air Space Use.

An evolvement of a workable traffic-control system must incorporate:

1. Flexibility in long-range flights to flight plan their projected flight plan over any area under IFR rules. Flexibility would bring in a tremendous area of so badly needed airspace.

2. Expansion of traffic control boundaries to about 800 miles width. This would allow a central control center to process all long-range

flights. To lessen the burden of communication, position reports should be about 350 miles apart for long-range flights.

3. Allocation of altitudes for long-range flights to 18,000 and above, whenever economically possible. Flexibility and allocation of altitudes for long-range flights would separate long-range flights from short range—flying from point to point.

4. Mandatory airborne radar equipment to establish a cooperative system among airliners which would lend to standardization and provision for anticollision and positive identification of other aircraft within a specific cubic area to allow lateral and vertical separation. A cooperative system must incorporate an airborne radar beacon such as the APN 69 and a radar receiver for navigation and search such as the APN 59.

A discussion of point 4 is in order.

Considerable emphasis and money has been placed to harness the command of the cockpit to a dependence upon radio ground aids and absolute control by a ground controller. Full dependence by aircraft on ground aids restricts the aircraft to the limitations of the ground aid. The effect is a confinement of the aircraft within that limitation resulting in a squeezing of vital airspace.

Emphasis must revert back to the aircraft itself. Each aircraft must be equipped and staffed by crew members to make it independent and flexible in its range with the greatest safety.

The command must rest with the pilot in command. Decisions must come from the cockpit where they belong.

Advocation of no control is not the intent here. Initially, a predetermined flight path is filed IFR according to weather pattern, economic consideration, and known traffic conditions.

However, en route, conditions may change the picture. Icing conditions, areas of severe turbulence, engine malfunctioning, and excessive headwinds call for evasive action.

The pilot in command mus take evasive action without undue delay or restriction. The pilot should be able to proceed and advise control what he is doing and where he is going.

A cooperative system of airborne radar will allow the pilot in command to avoid hazardous conditions by a search of the area for traffic before he proceeds. A projected surveillance of 200 miles at all times will keep the pilot in command advised at all times of traffic and weather.

A cooperative system of airborne radar such as the APN 59 and APN 69 radar beacon will provide such coverage and prevent collision of aircraft.

We highly recommend a cooperative system of airborne radar because whatever a self-contained system can do—a cooperative system can do better and simpler and with less equipment.

From an engineering point of view, a beacon device—receiver and transmitter—would make an easier solution for collision detection.

A self-contained system of airborne radar is highly theoretical—the cooperative system of radar, the incorporation of the APN 59 and the APN 69 is a proven system. Their use is standard in the United States Air Force.

An airliner carrying an APN 69 airborne beacon can be received clearly and positively at a distance of 200 miles. The feature is a must when rates of closure approach 800 miles or more.

Separation can be clearly defined to almost zero. To be able to interrogate lateral separation clearly and positively is the answer for jet commercial transport, for altitude allocation is a severe economic penalty in jet transport.

Mr. HALE. Mr. Summers, may I interrupt there?

Mr. SUMMERS. Yes, sir.

Mr. HALE. What do you mean by interrogate lateral separation? Do you mean interrogate?

Mr. SUMMERS. Yes. By interrogate lateral separation here, I mean the radar itself is interrogating separation clearly upon the radar screen. I think as I read along in the statement, I can develop that viewpoint a little more clearly.

Mr. HALE. I do not understand that sentence at all, but may be you make it clear further on.

Mr. SUMMER. Shall I proceed on this?

Mr. HARRIS. Yes, you proceed.

Mr. SUMMERS. For anticollision feature the use of an APN 59 and APN 69 is ideal and proven, although admittedly sophisticated just as an anticollision device.

Nevertheless, an aircraft using cooperative system of radar can automatically search the area of 1,000 feet below and above him with a 360° scan.

Siince the APN 69 has a code selection feature, altitude definition can be achieved simply by assignment of a code for a particular altitude. A target on the screen can then be identified by range, distance, and altitude. The ideal situation.

A visual or aural warning device can be incorporated to warn the pilot of impending danger of collision. Constant monitoring of the radar along with its navigational features, by a navigator, is the best insurance against collision on a long-range flight.

In conclusion, we make the following recommendation:

A cooperative system of airborne radar incorporating a radar beacon feature be adopted because:

1. It lends itself to standardization which could be and should be adopted and regulated by CAA and ICAO.

2. The APN 69 and APN 59 are the best in the field. They are proven instruments and in production.

3. A cooperative system of radar would put the decisions in the cockpit, where they belong. The resulting accuracy of positions and separation would greatly relieve the ground controller and create better cooperation and coordination.

4. The anticollision feature is unique and simple—and highly effective, again proven by the United States Air Force in formation flying and tanker rendezvous.

5. We specifically recommend to the committee that they call in the Air Force for a demonstration of the cooperative system of radar; that the committee contact the Weapons Guidance Lab, Wright Air Development Center, Dayton, Ohio, for their opinion of the radar units.

6. We urge the committee to put a stop to the "shrinkage" of the cockpit. Long-range flights call for a specialized navigation. We request a minimum crew complement of 2 pilots, 1 engineer, and 1 navigator to create the flexibility needed on long-range airlines.

It is only through accurate position reporting, positive identification of traffic, that the controller can survey his area and bring the traffic into an orderly approach at destination.

7. We urge the committee to place the emphasis within the airplane, on the instrumentation and design of the cockpit and on minimum crew complement to make the aircraft more safe and more flexible. The pressing need is a Federal regulated radar cooperative system incorporating an anticollision feature as well as the navigational.

Aircraft, whether they be short-range or long-range, must have mandatory airborne equipment that will insure a cooperative system of radar detection.

There is no question that if a cooperative system of airborne radar were a reality, the horrible tragedy over Grand Canyon would never have happened that day.

We owe the air-traveling public the responsibility that it will not happen, must not happen again.

Mr. HARRIS. Thank you very much, Mr. Summers. It is certainly an interesting statement. It is precise and to the point.

Are there any questions?

Mr. SUMMERS. Thank you, sir.

Mr. HALE. You say on page 5 you want a cooperative system of airborne radar incorporating a radar-beacon feature. Do those devices presently exist?

Mr. SUMMERS. Yes, sir.

Mr. HALE. The testimony that we have heard in this committee as I understand it, is that there is no suitable airborne radar for use in plane cockpits at the present time; am I mistaken about that?

Mr. SUMMERS. I heard that testimony today, Mr. Hale, and for the record I emphatically state that that information is highly inaccurate and not adequate.

Mr. HALE. We got the same testimony, unless I am very much mistaken, in Las Vegas, that radar appropriate for use in the cockpit of an airplane simply did not exist.

Mr. WILLIAMS. As I recall, we were told something about it being in the development stage.

Mr. HALE. There is no presently approved, obtainable commercial device.

Mr. WILLIAMS. That is right.

Mr. HALE. That is my understanding of all the other testimony before this committee. If that testimony is wrong, it is certainly very important. I do not suppose anybody would question for a moment the desirability of having good airborne radar.

Mr. SUMMERS. Mr. Hale, on page 5 in point 5, I ask the committee to ask the Air Force for a demonstration of the airborne radar features. I think certainly the answer is there for the committee and I certainly have material here indicating that the International Navigators Council has gone through the plant of Sperry. They went through it very thoroughly, investigated the instruments, the radar features, and if the committee so wishes I would like to introduce this for their study.

Mr. DOLLIVER. Will the gentleman yield?

Mr. HALE. Yes.

Mr. DOLLIVER. You refer to a cooperative system of radar?

Mr. SUMMERS. That is correct.

Mr. DOLLIVER. What do you mean by that? Do you mean there are two systems that work together; or what?

Mr. SUMMERS. Yes, sir. A cooperative system of radar incorporates the use of an airborne-beacon device which is transmitting a signal to the other aircraft.

In that way a definite, precise signal on the screen can be identified by other aircraft, and, just as testimony was brought out here this afternoon, it is sometimes very difficult for a search radar to pick up aircraft.

There are very few areas where radar can pick up expansive metal, or hubcaps, and so on.

Mr. DOLLIVER. Of these APN 59 and 60 which is the transmitter?

Mr. SUMMERS. APN 69 is the transmitter.

Mr. DOLLIVER. APN 59 is the receiver?

Mr. SUMMERS. The receiver and also a navigational search weather.

Mr. DOLLIVER. Have you ever had any personal experience with these two devices?

Mr. SUMMERS. Yes. We went through the experiment and investigated it.

Mr. DOLLIVER. I mean have you flown with it in the cockpit?

Mr. SUMMERS. No, sir.

Mr. DOLLIVER. Are you a flyer yourself?

Mr. SUMMERS. I am a navigator.

Mr. DOLLIVER. However, you have never been in a cockpit where these have been used?

Mr. SUMMERS. I have been in a cockpit and watched and gone through the features, but I have never gone, say, on a tanker rendezvous or such device as that.

My purpose here has been, as called for by the International Navigators Council, to show that some of the members have gone through the experience and use of the radar systems.

Mr. DOLLIVER. Do I understand from your testimony that presently the Air Force is using these very devices?

Mr. SUMMERS. Yes, sir.

Mr. DOLLIVER. How extensively are they using them?

Mr. SUMMERS. I cannot answer that, sir.

Mr. DOLLIVER. Are these devices classified?

Mr. SUMMERS. They have been recently declassified.

Mr. DOLLIVER. How long since?

Mr. SUMMERS. I have no idea. I have gotten material from Sperry which has gone through security and so on, and they have published some of these instruments.

Mr. DOLLIVER. And you have seen the devices; have you?

Mr. SUMMERS. Yes, sir.

Mr. DOLLIVER. How large are they? How much do they weigh?

Mr. SUMMERS. I have the specifications right here, sir.

The APN 59 weighs about 150 pounds and the APN 60 is similar.

In my statement I said that the instruments were sophisticated in the sense that they were manufactured specifically for Air Force use and that they had their own pressure systems and applied a lot of shock treatment to it, whereas in production for commercial airlines you would not need that.

Mr. DOLLIVER. How expensive are they?

Mr. SUMMERS. I have no idea, sir. I have never investigated the expense.

Mr. DOLLIVER. Thank you.

Mr. HARRIS. APN 69 is the beacon.

Mr. SUMMERS. Yes, sir.

Mr. HARRIS. And APN 59 is the receiver.

Mr. SUMMERS. Yes.

Mr. HARRIS. And they are both aboard the plane?

Mr. SUMMERS. Yes.

Mr. HARRIS. What about the smaller planes that could not carry radar? Would that present a hazard?

Mr. SUMMERS. I really couldn't say. With allocation of altitudes I would think it would not create a hazard.

Mr. HARRIS. In other words, it would not be necessary for all planes, then, to have these devices.

Mr. SUMMERS. I strictly confine the report to commercial aircraft flying long range, jet airliners, and so on.

Mr. HARRIS. Thank you very much. We are very glad to have this discussion and the presentation by you.

The committee will adjourn until 10 o'clock tomorrow morning, at which time the Under Secretary of Commerce, representatives of the Air Force, and the Air Transport Association, and others, will appear.

The committee will be adjourned.

(Thereupon, at 4:30 p. m., the committee was recessed until 10 a. m., Thursday, September 13, 1956.)

AIRSPACE USE STUDY

THURSDAY, SEPTEMBER 13, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON TRANSPORTATION AND COMMUNICATIONS
OF THE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D. C.

The subcommittee met at 10:20 a. m., pursuant to recess, in room 1334, New House Office Building, Hon. Oren Harris (chairman of the subcommittee) presiding.

Mr. HARRIS. The committee will come to order.

This morning we are glad to welcome back to the subcommittee in connection with the study of airspace use and navigational aids, the Under Secretary of Commerce, Louis S. Rothschild, who is in charge of transportation and Chairman of the Air Coordinating Committee.

Mr. Rothschild, we are glad to have you back this morning because we understand that you are to bring to the subcommittee data and information resolving the complicated technical controversy over air navigation aids, which, as you know, was the subject of extensive hearings by this committee a year ago, when you and representatives of other Government agencies and the industry appeared.

I might say for the information of those present that following Mr. Rothschild's presentation, we will have Dr. Clifford Furnas, Assistant Secretary of Defense, Research, and Development, who also will give the committee information as to the development of equipment to meet the needs of the jet age.

I am very glad to know that progress has been made in the last several weeks on this complicated question of air navigation aid, and I do not know of anyone better qualified to give the story and tell us just what the situation is than you, Mr. Rothschild.

We are glad to have you back.

STATEMENT OF HON. LOUIS S. ROTHSCHILD, UNDER SECRETARY OF COMMERCE, AND CHAIRMAN, AIR COORDINATING COMMITTEE

Mr. ROTHSCHILD. Thank you, Mr. Chairman.

Before I get into my prepared statement, I should like to comment on two very sad events that have happened to the world of aviation. In the death of Mr. Carl Hinshaw, your colleague, and in the death of Mr. Charles Lowen, Jr., the world of aviation has lost 2 of its most preeminent leaders, and I, personally, have lost 2 good and warm friends.

Mr. Hinshaw, as everyone knows, was vitally interested for a great period of years, and by the use of his large area of talents made possible some of the notable progress in the world of aviation.

Mr. Lowen, in his brief but active and eventful career as head of the CAA did a similarly fine job. I know that you and the members of your subcommittee have the same sorrow that I have at the passing of these two wonderful gentlemen.

Mr. HARRIS. Yes. We certainly share the sentiments that you have expressed and so stated at the outset of the hearings on Tuesday of this week.

Mr. ROTHSCHILD. I will go on with my statement, sir.

I welcome this opportunity to appear before you this morning to discuss the significant progress which has been made by the Air Coordinating Committee in developing a common system for joint civil-military use, with particular reference to the resolution of the short-range air navigation problem.

The ACC, on August 30, 1956, reached agreement on a national program for integrating the very high and ultrahigh frequency electronic civil and military air navigation systems into the common system in order to provide the most comprehensive and modern direction and distance measuring navigation service through the United States. This integrated navigation system will be known as Vortac.

During the 1st session of the 84th Congress, this subcommittee completed a report on its investigation of the development of the common system of air navigation and traffic control. This report, as well as the hearings which preceded it, were of considerable help to those of us in the executive branch charged with the responsibility for resolving the highly complex problems which were existent in this area.

At the time of your previous hearings in 1955, there were many technical unknowns. I am happy to report to you that these have been resolved or are now known to be capable of resolution. The solution which has been reached we believe to be in the best interests of the United States and, additionally, is acceptable insofar as we know to all concerned.

In arriving at this solution, it was necessary to, and the Air Coordinating Committee did give the fullest possible consideration to each of the major segments of United States aviation. This included, of course, the 40 million Americans who are presently traveling by air each year in our scheduled airliners, and their need for the safest and most efficient system possible; the tactical and national defense needs of the military; and the needs of all the business and private airplane operators in the country.

The timing of our program had to be most carefully worked out and was most important because of extensive military requirements for high performance aircraft operations, and the planned introduction of civil jet transport flights in the United States in 1959, both of which require a compatible distance measuring system in the interest of national defense and a common system of operation.

The needs of the many thousands of private and business airplane owners will also be accommodated by the United States Vortac program. This program includes the expanded implementation of the very high frequency omnirange VOR azimuth (directional) navigation system with its associated voice and ILS localizer features and its continued use into the long-term future.

Integrated with this will be a mutually compatible ultra-high-frequency system which will provide distance information for military operations and civil aircraft flights, as well as azimuth information for strictly military needs.

The requirements of air traffic control were also a determining factor in arriving at the solution contained in the VORTAC program. As your subcommittee well knows, prior to this time we had two systems developing independently—a VOR/DME system and a TACAN system. These systems would have operated independently, and, by so doing, not only would have interfered with one another but would have vastly complicated air traffic control in this country.

By integrating the best parts of both systems on a compatible basis, we will now have a common system of air routes and air traffic control, as has been stated by your committee to be necessary.

The United States common system of air traffic control and navigation is made up of a number of elements which include navigation devices, air routes, operating procedures, regulations, and air traffic control with its many allied tools and equipments, such as radar and communications facilities.

We feel that exceptional progress has been made toward achieving the basic common-system aim. We believe that the VORTAC program represents the best possible comprehensive air navigation system which we can now devise.

You will recall that we have today 438 VOR stations throughout the country. We have installed at these stations and some other locations some 235 fully operational DME stations and 145 stations which are not in commission.

This system, while it can serve the civil, will not meet the needs of the national defense of this country. Because it is now known that in any future conflict the United States may be a theater of war, we were required to revise the common system concept to accommodate our tactical military requirements in addition to previous nontactical and nonmilitary requirements.

The VORTAC program, while making the maximum use of the civil system, now will replace the partially installed DME system with TACAN. It is intended to provide the civil DME service on most of the stations now operating for the next several years in order that we can develop distance procedures and train technicians.

The VORTAC program will also be an important part of the accelerated Federal airways program previously referred to as the 5-year plan now in the process of being telescoped.

At the time your committee considered the ACC program on electronic short-range navigation systems last year, you endorsed that program in general. Its primary recommendations at that time were directed toward the resolution of various technical unknowns inherent in the TACAN system.

The ANDB, as Dr. Furnas will report to you, took widespread measures within the scientific and manufacturing fields to determine the possibility of resolving these technical unknowns. As a result of the ANDB findings that TACAN was suitable for inclusion in the common system, the ACC undertook to analyze the entire United States short-distance navigation program.

The air traffic control and navigation panel of the ACC has the primary responsibility for coordinating the implementation programs,

operational requirements, and procedures of the United States air traffic control and navigation system. It is composed of those people who are best qualified to advise the Government in these fields.

It was under the chairmanship of our late CAA Administrator, Mr. Charles J. Lowen, and its membership consists of the air navigation and traffic control division heads of Government agencies and their counterparts from industry.

The ACC directed its navigation panel to proceed on a full-time high-priority basis, with the known facts and technical reports, to determine the best short-distance navigation system. The panel, meeting day and night, exhaustively examined the technical, operational, economic, and international aspects of the matter and recommended a program and course of action which was adopted, with slight modification, by the Air Coordinating Committee.

The Air Coordinating Committee conclusions which constitute the proposed course of action are as follows:

General: In view of the extensive military requirements involved and the planned introduction of civil jet operation in the United States in 1959, the United States should proceed on a high-priority basis to complete the implementation of the United States azimuth and distance (Rho-Theta) air navigation system in order to extend the fullest benefits of the azimuth system to general aviation, air transport, military tactical, and other segments of aviation at the earliest possible time; and in order that the need for provision of distance measuring service to high-performance air transport and military aircraft will be met. This is in accordance with the accelerated Federal airways program now underway, which is endorsed by the President and the Congress.

Specifically: 1. The omnirange VOR azimuth navigation system is required by all categories of aircraft operators, and will continue to be expanded as planned both at present and in the long-term future.

2. TACAN should be integrated into the common system to meet military requirements.

3. The military services will continue their implementation of TACAN in order to meet the national defense requirements of the country. These facilities will be integrated operationally into the domestic Federal airways and the air traffic control system.

4. The clear-channel distance measuring equipment will be integrated into the navigation system in order to provide the civil jet transport, military jets, and other civil and military aircraft with distance measuring and improved air traffic control servce by July 1, 1959, for high altitude en route and for terminal operations.

5. Specifications and prototype equipment should be developed for a TACAN compatible ground DME intended for use at certain VOR and ILS sites, either domestic or international, where required.

6. The NAV panel will review the distance-measuring requirements of general aviation and other users, and recommend appropriate additions for clear-channel DME ground environment.

7. In order that aircraft operators presently using DME will be able to continue using the service and in order that operational procedures for the use of distance information may be further developed, and technical training advanced, the distance-measuring system presently in operation could be continued until 1960 except as frequency or other conflict with VORTAC necessitates phasing it out of service. The Civil Aeronautics Administration will establish a progressive decommissioning plan for civil DME.

8. The Government will investigate the feasibility of replacing with VORTAC DME the airborne civil DME which has been purchased and installed in civil aircraft prior to August 30, 1956.

9. The Government will lend technical assistance in the development of a low-cost, airborne clear-channel DME for general aviation and other users.

10. A decision as to possible use of the ultrahigh frequency azimuth portion of VORTAC for civil purposes will be considered after this element of the system has undergone wide operational use in military operations, as well as civil inservice evaluation.

11. The United States, consistent with past practice, will take the necessary steps through ICAO to fully advise the member States of its actions, make technical information available to them, and when appropriate, propose ICAO consideration of a new distance measuring standard specification.

Mr. Chairman, in addition to the detailed report which I have just given you on this major VORTAC program, I would also like to briefly tell you about some of the other work of the Air Coordinating Committee.

The Navigation Panel recently completed and approved a United States program for development of a long-distance navigation system which is in support of and consistent with the ACC's recommended policy on long-distance navigation aids.

The midair collision potential and air-traffic problems in areas of high density air traffic led the Navigation Panel, after a most intensive operational study, to bring about the institution of a trial operational plan in the Washington, D. C., area, which was in operation from August 1955 to July 31, 1956.

The operation of these trial procedures was closely monitored by a special group of operations experts and pilots and resulted in recommendations by the Navigation Panel to the member agencies of ACC with statutory responsibility for implementing action.

The high-density zone procedures under trial included a speed limit within the area of heavy traffic of 180 miles per hour—156 knots—required 2-way radio communications, and special visibility flight rules which changed ceiling and visibility requirements.

I should point out that this entire plan is in addition to the instrument operation which has been proven over the years to be most safe. It operates in good or marginal weather conditions when instrument rules are not in effect. As a result of the ACC recommendations, the Civil Aeronautics Board has taken steps to promulgate appropriate regulations for nationwide application.

The Navigation Panel is continuing to meet on practically a full-time basis, and is completing a far-reaching air operational policy report known in aviation circles as the Special Working Group 13 Study. The ACC expects to consider and publish this report near the end of October. It will deal primarily with new operational procedures and concepts which are required for the jet age.

The ACC, also through its Navigation Panel, coordinated the CAA Federal airways plan with all interested agencies of the Government and industry.

Other ACC activities, responsive to your inquiry, include revision and coordination of airways planning standards, United States standard flight inspection procedures, policy regarding visual flight rules navigation requirements, and standard identification methods.

The ACC has also been engaged in determining which functions of air-defense and air-traffic control are capable of integration. This activity was initiated by the Navigation Panel in June 1955, and a program and policy concerning it was approved by the ACC on October 11, 1955.

It involves an ANDB sponsored project with CAA study teams at the SAGE—semiautomatic ground environment—project, and the installation of a CAA Air Operations Evaluation Center Annex at the Air Force air-traffic-control project at Deer Island near Boston.

I believe I have reported to you in sufficient detail to give the sub-

committee an indication of the large scope of common system work which is in process. I am providing for the record a copy of the ACC Annual Report in order that the committee may see not only the common system efforts of ACC, but those in other fields of aviation, both international and domestic.

I am sure you will have some questions,Mr. Chairman. If you do have, I will be glad to try to answer them. I have with me several of the expert technicians from the various agencies who will be glad to assist.

Mr. HARRIS. Thank you very much, Mr. Rothschild, for this splendid report you have given to the committee.

Recognizing the technicalities involved, I am not sure I fully comprehend the entire problem, but on the basis of the hearings we have had in the past, your statement does reveal that a great deal has been accomplished in the last year.

We will receive the annual report to the President by the Air Coordinating Committee for 1955.

(The report referred to was filed with the committee.)

Mr. HARRIS. I also observe that you have a release which was gotten out by the Air Coordinating Committee dated August 30, I believe.

Mr. ROTHSCHILD. That is correct, sir.

Mr. HARRIS. This is about what you gave in your statement?

Mr. ROTHSCHILD. Yes, sir.

Mr. HARRIS. It will not be necessary, then, to include that release in the record.

Mr. ROTHSCHILD. Whatever is your pleasure, Mr. Chairman.

Mr. HARRIS. I think that would be repetitious.

I am sure there must be some questions in the minds of the members of the committee.

Mr. Rogers, have you any questions?

Mr. ROGERS. Mr. Secretary, as I understand it, the VORTAC program is for the purpose of resolving the conflict which existed between the VOR/DME and TACAN. We had long hearings on that before. As the chairman pointed out, there are so many technicalities involved in it, it is difficult for me to search around except in the dark.

When do you expect, under the VORTAC program, to establish the full common system, to accomplish a full resolution of the conflict and a working out of the common system?

Mr. ROTHSCHILD. Mr. Rogers, I think the conflicts are resolved as of now. There are no longer any philosophical conflicts.

Mr. ROGERS. I don't mean philosophical conflicts. What I am talking about are the physical conflicts.

Mr. ROTHSCHILD. We know today, as Dr. Furnas will indicate to you a little later, I am sure, that there are no apparent unsolvable problems in the equipments which have been adopted.

If your question runs to when will these equipments be installed on the airways, we shall start as soon as possible. We are today again, under the ANDB, developing the requirements of the various components of the system.

Some of the equipment is currently on order by the military. More of it will go on order as soon as possible. We will have installed and in operation, according to our present plans, enough VORTAC to furnish the necessary service to the civil jets and the military by 1959.

Mr. ROGERS. By 1959. As I understand the VORTAC program—and you correct me if I am wrong—it is a combination of the VOR and Tacan.

Mr. ROTHSCHILD. That is correct, sir.

Mr. ROGERS. As I understand, what you are searching for is one common system for joint use by military and civil aviation. There won't be a conflict or even a remote conflict. Is that correct?

Mr. ROTHSCHILD. The common system includes much more than just this VORTAC arrangement. This is a set of equipments which will provide short-range navigational information.

There are also various other things. The common system, as a whole, includes all of this.

As to whether or not there would have been a conflict had there been two systems side by side, the answer to that is definitely "Yes," it would have been an intolerable situation. We could not have lived with it. There had to be some resolution of the problem so that aircraft flying would be on the same routes and therefore they would be safely operated.

Mr. ROGERS. You referred to several other facets, Mr. Secretary, insofar as the common system is concerned. The end result will be that the system will be a common system used by all in the same manner?

Mr. ROTHSCHILD. Yes.

Mr. ROGERS. That is what you are driving at. I am frank to say I think that is what you should be driving at.

In this changeover, what can be anticipated insofar as investments by the private owners of airplanes?

Mr. ROTHSCHILD. In the case of this equipment, as in the case of many other equipments, it is up to the owner to determine which kind of navigational and communications equipment he wants on his aircraft.

Mr. DOLLIVER. You are not referring, of course, to commercial airline equipment.

Mr. ROGERS. I am talking about privately owned aircraft.

Mr. ROTHSCHILD. Some will want very much more in the way of equipment than others will. The market will furnish, according to our present information, various types of this equipment at various prices to accommodate the purses and desires of those people who wish to buy all or part of this equipment.

Mr. ROGERS. That will enable them to be within the confines of this common system insofar as the requirements are concerned for flying?

Mr. ROTHSCHILD. That is correct, sir.

Mr. ROGERS. Is it anticipated, Mr. Secretary, that in the future other rules and regulations might be adopted that would be burdensome on the private owners of airplanes insofar as providing equipment for their craft which might be required because of safety regulations? Do you have anything like that in mind at the present time?

Mr. ROTHSCHILD. Mr. Rogers, I am sure that, no matter what the Government decides on, some people will object.

Mr. ROGERS. I am sure of that.

Mr. ROTHSCHILD. They will consider some things burdensome even if it means the saving of their skin.

Mr. ROGERS. That is something we cannot pass on right now, Mr. Secretary. What I am thinking about is, Do you, as Under Secre-

tary of Commerce, anticipate the promulgation of any rules or regulations that will require aircraft in the future to have much additional equipment that will be very costly because of the taking on of this particular plan or program?

Mr. ROTHSCHILD. In my statement I referred to a plan now in the course of development which will probably extend the high density experiment which we had here in Washington for about a year over the whole country, wherever there are areas of high density.

One of the rules that will be established if the same rules are continued—and I rather think they will be—will require that anyone flying in that area of high density is obliged to have two-way radio in his plane. If that is a burden, the answer to your previous question is "Yes."

Mr. ROGERS. If that is a burden, he doesn't have to fly in that area.

Mr. ROTHSCHILD. No, sir; he doesn't have to fly in there.

Mr. ROGERS. He can fly in a 25-cent area rather than in a 50-cent area. That is all, Mr. Chairman.

Mr. HARRIS. Mr. Dolliver?

Mr. DOLLIVER. I have some questions.

Mr. Secretary, I well recall quite a number of months ago, Mr. Chairman, that we had in this very room an off-the-record session which was considering the claims of the original omnirange and tactical air navigation system (VOR-TACAN).

At that time a great deal of the information was classified. Now we find months later that these claims have been brought together and that we are developing a common system. I think you, Mr. Chairman and the committee, can take some satisfaction and even some credit for bringing this conflict to light some months ago and pinpointing it before the people who are interested in and are engaging in civil aviation, as well as military.

I think this is a good example of the service that is rendered by a committee of Congress to the general welfare of the public in reconciling views which appeared at the time, at least, to be quite irreconcilable.

As I recall, there seemed to be no common ground at that time, and you, Mr. Secretary, and the Air Coordinating Committee, have done a splendid job in bringing about a coordination in this endeavor. I think we all can take a great deal of satisfaction in what you have done.

Mr. ROTHSCHILD. Mr. Dolliver, you are quite right in saying that the committee was most helpful in getting a determination made, but a great many agencies and people have participated in this decision.

Mr. DOLLIVER. I am sure of that.

Mr. ROTHSCHILD. And each one of them deserves his share of the credit.

Mr. DOLLIVER. I am glad to accord that, and I am sure the committee is, too, but we can't escape expressing a little satisfaction.

Mr. ROTHSCHILD. I just didn't want to claim all of this for the ACC because many other Government agencies had a big hand in it, too.

Mr. DOLLIVER. Now, I want to ask you some questions. I assume that there is no longer any classification about this information. Am I correct about that?

Mr. ROTHSCHILD. Nothing that I have said this morning is classified.

Mr. DOLLIVER. If I get into an area which is classified, I hope you

will say so. I have no desire to reveal anything that should not be revealed.

I well recall that there was a difference in accuracy claimed as we discussed the visual omnirange and the tactical navigation system. Does the new VORTAC system secure for the traveling public and the military closer and greater accuracy of determination?

Mr. ROTHSCHILD. Dr. Furnas will undoubtedly be able to give you some precise information on that, but in general, Mr. Dolliver, the VORTAC system will be as accurate as anything that has been developed up to date in this field.

As I understand it, it will have an accuracy within 1°, plus or minus.

Mr. DOLLIVER. Also, there seemed to be a very great difference between the VOR system and the Tacan system with respect to sighting requirements. At least it was so claimed by some of the witnesses, as I recall.

The Tacan had a much better record than the VOR system as far as sighting on ships and in battlefield areas. What has happened in that respect with VORTAC?

Mr. ROTHSCHILD. In my statement, I referred to the fact that the tactical requirements of the military had to be met because the United States would very likely be a theater of war in the next conflict. The matter which you are now discussing is one of those tactical requirements, and was one of the reasons why the Tacan element was chosen to be a part of VORTAC.

Mr. DOLLIVER. The next thing that I recall about the difference between the two systems is that the Tacan system had no audio communication, quite in contrast to the VOR system. I may be in error in my understanding, but that is the way I remember it.

Has that been resolved, and in what way?

Mr. ROTHSCHILD. In this fashion, Mr. Dolliver: VORTAC will include VOR, which has its voice communications channels.

Mr. DOLLIVER. Will there be any radical revision of the wave length used by the VORTAC system as contrasted with the VOR system?

Mr. ROTHSCHILD. No, sir. The VOR portion of VORTAC will continue to use the same wave band that it was in, and the TCAN element of VORTAC will continue to use its prior assigned space.

Mr. DOLLIVER. Does that mean, then, that the presently existing visual omnirange equipment can continue to be used under the VORTAC?

Mr. ROTHSCHILD. Indefinitely into the long-term future.

Mr. DOLLIVER. So there is really no loss of utility by reason of obsolescence of the presently existing VOR system?

Mr. ROTHSCHILD. That is correct, sir.

Mr. DOLLIVER. I think you said a moment ago that there were other components in VORTAC besides VOR and TACAN. Does that include the instrument landing system and the approach procedure?

Mr. ROTHSCHILD. I think my statement said there were other components in the common system besides VORTAC, and they include navigation devices, air routes, procedures, regulations, and air-traffic control. That is all part of the common system. The VORTAC is an element of the navigation system.

Mr. DOLLIVER. Will the VORTAC system make obsolete such things as ILS?

Mr. ROTHSCHILD. Oh, no, sir.

Mr. DOLLIVER. That will still be a part of the landing arrangement at high-density airports?

Mr. ROTHSCHILD. Yes, sir.

Mr. DOLLIVER. It will not in any way make obsolete the presently existing equipment?

Mr. ROTHSCHILD. It will in time make obsolete the DME equipment.

Mr. DOLLIVER. That is the distance measuring equipment. Actually, that program never did get completely under way; did it?

Mr. ROTHSCHILD. No, sir; it never did.

Mr. DOLLIVER. But VORTAC does make that completely useless; is that correct?

Mr. ROTHSCHILD. VORTAC will supply a distance measuring service which will supplant that now being offered in a very limited way by civil DME.

Mr. DOLLIVER. In connection with the development of the VORTAC, I assume that the military in all its aspects has been brought into consultation and agreement?

Mr. ROTHSCHILD. The Air Navigation and Development Board, Mr. Dolliver, is made up of two members, the Department of Defense and the Department of Commerce. All the technical findings on these equipments were made under the auspices of the Air Navigation and Development Board.

After they had been found technically suitable, then the next step was consideration by the Air Coordinating Committee of various other factors such as the economic factors and our international commitments, and various other factors.

The Air Coordinating Committee is composed of 11 members. Three of those members are the Army, the Navy, and the Air Force. So the military has been in on this at all stages, and Captain Eldridge of the Navy served as Vice Chairman of the NAV Panel which did all the work leading up to the Air Coordinating Committee's findings.

Mr. DOLLIVER. I would like you to describe the functions that actually will be performed when we have full and complete development of the VORTAC system, with respect to its functions for the fix of the plane itself in the air, with respect to its functions for warning against objects, either movable or immovable in the path of the plane, with respect to its function for bringing in the plane in heavy weather, with respect to its function for intercommunication between ground and air, or between the plane and other planes.

Mr. ROTHSCHILD. If you want this information in broad, general terms I will take a whirl at it. If you want to get down to technical appellations, that is a little beyond me, but there are people here who can do it.

Suppose I start out, and if mine is not good enough, we will call on some of the rest of them.

Mr. HARRIS. I should think, Mr. Secretary, it would be advisable if you did that, because I have the feeling that you talk in layman's language on this subject which we can understand, and these technicians probably will get beyond us.

Mr. ROTHSCHILD. When the ground stations are installed and when planes have the airborne equipments installed, there will be so far as the practical use of the equipment is concerned two dials on the instrument panel. One dial will tell the pilot exactly where he is directionally.

Mr. DOLLIVER. Which was the function of the visual omnirange?

Mr. ROTHSCHILD. That is right, sir. The other dial will tell him exactly how many miles or knots he is from a station to which he is tuned in.

Mr. DOLLIVER. Do you mean by station an airport or a VORTAC station?

Mr. ROTHSCHILD. It will be a VORTAC station, which might be located on an airport and very likely will be in many instances, and will also be located at some other points.

So he will have information by reading dials which up to now he has never been able to get in that fashion. He has had the information, but not so precisely, nor so rapidly, nor so conveniently as he will now have it.

This added convenience and added saving in time is necessary because of the great numbers of high-performance aircraft which travel at high altitudes and at high speeds.

Mr. DOLLIVER. Will that information be furnished automatically, or will he have to seek around for it by voice?

Mr. ROTHSCHILD. No. All he has to do is tune in one of these stations and that registers right on these two dials.

Mr. DOLLIVER. Very well.

Mr. ROTHSCHILD. These equipments will not tell him that he is in danger of running into a mountain or another aircraft, for that is not their function. I think that was part of your question. He will not know that. But he will be flying as he always has been flying, with charts.

If he knows he is in a certain direction and at a certain distance from a station, he knows almost precisely where he is and by reference to the chart will have a better chance to avoid any fixed objects, like mountains.

Mr. DOLLIVER. What about intercommunications?

Mr. ROTHSCHILD. The voice facility which is now part of VOR will continue to be part of VOR.

Mr. DOLLIVER. We had a witness yesterday who recommended the installation in the cockpit of every airplane of a dual radar system of 1 radarscope and 1 beacon; is that contemplated in this?

Mr. ROTHSCHILD. That is another element of our investigation and undertaking, Mr. Dolliver, and it has no connection with VORTAC.

Mr. DOLLIVER. You are considering that?

Mr. ROTHSCHILD. Quite a few aircraft are today equipped with weather radars, and more of them, I am sure, will be in the future.

Mr. DOLLIVER. That is military; is it not?

Mr. ROTHSCHILD. No; quite a few of the airlines have some partial installations, too.

Mr. DOLLIVER. By this intercommunications system, is communication possible not only between the ground and the plane, but between planes in the air?

Mr. ROTHSCHILD. Yes. But this VOR is not the only way that a pilot may communicate with the ground. He also has his radio separate and apart from his VOR.

Mr. DOLLIVER. On a different wavelength?

Mr. ROTHSCHILD. And with some hundreds of channels available to him.

Mr. DOLLIVER. So if one system of intercommunication breaks down, he still has something else available?

Mr. ROTHSCHILD. Yes, sir.

Mr. DOLLIVER. In the testimony yesterday, it was brought out that the Air Coordinating Committee had a great deal of work to do in the international field. Has that work you have done in developing the VORTAC system had any impact in that respect?

Mr. ROTHSCHILD. It is only 14 days old, Mr. Dolliver, and I have no doubt that we shall have some small, or perhaps even large problems to work with in the international field, but I see no reason why they cannot be resolved, as previous ones have been resolved. In fact, I am sure they will be.

Mr. DOLLIVER. As I remember it, one of the elements which came out at our previous hearings was that some of the other aviation nations had their own systems and were developing them along different lines than VOR/DME, and finally, they did somewhat reluctantly come to our system. Now here is another change.

Mr. ROTHSCHILD. There may be some inconvenience involved for some nations, but VOR will continue to be good into the indefinite future. So anyone who has invested any money in that kind of equipment, whether they be an individual or another government, has just as good an investment today as he had when he bought the equipment.

It is possible that there are a few DME's which have been put into use outside the United States, but it is my belief that if any of them have been, they were furnished to others through the generosity of the Government of the United States and they don't have any investment in them.

Mr. DOLLIVER. When our committee a few years ago was in Sweden we saw a demonstration of some radio equipment in a Swedish laboratory for controlling flight while in the air. I suppose that has not had any impact on what we have done in this country.

Mr. ROTHSCHILD. I think you will find that in most of the industrial nations of the world there has been some work in various fields of air navigation and communications for air navigation. Some of the equipment which is produced elsewhere in the world is good, is excellent.

Mr. DOLLIVER. What happens to one of our international planes which flies to Europe or Africa or wherever they fly to when it gets into an area where they do not have the kind of communications and the kind of approach and various other systems that we have in the United States?

Mr. ROTHSCHILD. Through the medium of the International Civil Air Organization, there has been a standardization of equipments all over the world, and all airlines which operate internationally use standard equipments; that is to say, not necessarily all radios made by one manufacturer, but all built to one set of specifications, so their use is interchangeable.

As I say, this International Civil Air Organization is the medium through which all this has been accomplished. There is no problem in that field that I know of.

Mr. DOLLIVER. That is all, Mr. Chairman. Thank you.

Mr. HARRIS. Mr. Springer.

Mr. SPRINGER. I have no questions.

Mr. HARRIS. Mr. Secretary, if I may proceed along the lines of the questions of Mr. Dolliver for a little further clarification in my own mind, as I recall from the hearings last year, hearings in which everyone sort of let their hair down, VOR was one facility and DME was another facility.

You had to have these two types within the airplane, and then you had to have separate stations on the ground.

Mr. ROTHSCHILD. Yes, sir.

Mr. HARRIS. As I understood, the VOR station, particularly, was a rather sizable piece of equipment, and the DME portion of it also was a sizable installation which could not be installed on a ship at sea. Is that your understanding?

Mr. ROTHSCHILD. It could be installed, but it didn't work right after you got it installed. It was the VOR that didn't work right, Mr. Chairman.

Mr. HARRIS. The VOR?

Mr. ROTHSCHILD. That is right.

Mr. HARRIS. As I recall, it was claimed it was too much and you couldn't put it aboard a ship. The military claimed that this, together with the fact that it required certain large antennas on these fast jets, would make the other type much more desirable.

Was that actually the conflict at that time?

Mr. ROTHSCHILD. That was a part of the conflict; yes, sir. There were many other items and elements that had to be determined, too.

Mr. HARRIS. Yes, I understand. The thing that struck me was that the jets could not install VOR antennae because it would slow down the plane.

Mr. ROTHSCHILD. That is correct.

Mr. HARRIS. The TACAN, as explained in layman's terms here, was in one box, and had no voice to it. It was an electronic pulsating device, I believe, if that is the correct term, which included a distance measuring instrument.

Also, it could be installed on a ship at sea so the Navy planes could have better equipment and safer equipment to come in on. As I recall, that was the problem which was presented to us.

I suppose in this agreement which you have explained here, reached by all parties, that you took the omnirange and integrated it with the TACAN measuring phase.

Would that be a correct summation?

Mr. ROTHSCHILD. I think it is pretty nearly correct, except that you will have both the pulsating message and the voice.

Mr. HARRIS. You mean you will retain the pulsating message that is in TACAN now with this new device?

Mr. ROTHSCHILD. Yes, sir, and that will automatically record on these two dials on the instrument panel.

Mr. HARRIS. As I recall, the people who testified before indicated that DME and TACAN were not compatible and, therefore, could not be worked in together.

Mr. ROTHSCHILD. The things which were not compatible were TACAN and DME, because they operated on the same wavelength.

Mr. HARRIS. That is true, but also in TACAN you get the same service, as I recall, that you would get from DME.

Mr. ROTHSCHILD. Yes, sir.

Mr. HARRIS. Consequently, you get the same service from the DME portion of TACAN, as I call it, which may not be correct. In other words, it does the same thing.

Mr. ROTHSCHILD. It does the same thing and in the same manner.

Mr. HARRIS. Has the manufacturing industry come through and advised that they could produce this equipment?

Mr. ROTHSCHILD. Oh, yes, sir. The ANDB, as Dr. Furnas will tell you, did a very exhaustive job in that area before their recommendation came out that TACAN was a suitable element for the common system.

Mr. HARRIS. I don't want to go into Dr. Furnas' testimony here at this time, but I was interested in knowing if the industry can produce equipment at reasonable prices.

Mr. ROTHSCHILD. In that connection, Mr. Chairman, perhaps you would be interested in this. A great deal of the work on TACAN had been developed by a single manufacturer, the Federal Telecommunications Laboratories.

If we are to put all this into operation at the speed at which it is necessary, it is doubtful if any one manufacturer can produce all of it, and even if he could, it would be doubtful practice on the part of the Government to go ahead on that basis.

So knowing this, I asked for a statement from International Telephone & Telegraph Corp., the parent of Federal Telecommunications Laboratories, and I think it would be well to put it in the record.

Mr. HARRIS. Very well, it would be well to have it because that was one of the problems, as I recall before, there was only one company that produced the TACAN and some were not too sure of it then, as I remember. At least there was a difference of opinion as to whether or not it was really effective.

Mr. ROTHSCHILD. I might say this:

In the beginning the TACAN element of VORTAC, which we are talking about today, is a vastly improved TACAN over the one we were talking about when we were last here.

Mr. HARRIS. Would it be correct to say that you have TACAN as we had it described to us with VOR integrated in it?

Mr. ROTHSCHILD. That is right. We will have two directional elements, one furnished by VOR and one furnished by TACAN. The VOR directional element will also have voice capability. We will have one distance measuring service furnished by TACAN/DME.

To get back to this position of International Telephone & Telegraph, this is a communication from them which reads as follows:

International Telephone & Telegraph Corp. will make their patented inventions incorporated in the TACAN radio navigation system available by nonexclusive licenses upon reasonable terms for use by all who desire to employ them for commercial aviation.

A list of such patents will be communicated upon request to International Telephone & Telegraph Corp.

Should the Department of Commerce deem it useful, and subject to the approval of the Defense Department, the International Telephone & Telegraph Corp. will communicate to the Department of Commerce a comprehensive file con-

taining technical information on the airborne DME part of the military TACAN equipment in production at present, such as, schematics, component values, and general design features, for communication to the industry.

So I think we have no patent problem.

Mr. HARRIS. That is certainly good information, too.

How much is this equipment going to cost?

Mr. ROTHSCHILD. It depends on how fancy you want to get, Mr. Harris.

Mr. HARRIS. Well, to have it installed as you expect, for example, in the commercial airlines?

Mr. ROTHSCHILD. It will cost about in the range of five to six thousand dollars per plane for the commercial version, commercial airline version.

Mr. HARRIS. Commercial airline.

Then, of course, perhaps in the military the cost might go up because of certain other items?

For a private plane it might go down; is that right?

Mr. ROTHSCHILD. It would be less for the private plane; yes. I doubt that the military will be any higher than the commercial.

Mr. HARRIS. But is it fair to say that the private business planes, the smaller planes, do not have any worry about any unnecessary, as Mr. Rogers termed it, burdensome requirements to operate their planes in the future by the adoption of this system?

Mr. ROTHSCHILD. I would think that anyone who owns and operates a fairly large business aircraft will buy this equipment when it is available and they will probably buy the best version of it, because these larger business aircraft are expensive aircraft and they do a very important job for their owners.

I would think that some of the smaller business aircraft would have less than the whole VORTAC system installed in them and I would contemplate that very few private pilots who are weekend fliers in the main would buy anything more than VOR, if that.

Mr. HARRIS. Well, I wanted to get that very clear for the record because there are so many people with these small planes throughout the United States who are tremendously interested in the problem.

Thank you very much.

Mr. ROGERS. One question.

Mr. Secretary, I do not know whether you have worked it out or not, and I may be getting ahead of the picture, but have you worked out costs insofar as the Government is concerned, the cost of this system, what it is going to cost the Government to make this changeover?

Mr. ROTHSCHILD. Yes, sir.

In the first year of installation, which will be 1957, there will be involved in ground station expenditures about $50 million. In the second year, there will be about $15 million. Beyond that, our figures are not very good yet and I would rather not guess at them.

Mr. ROGERS. That part of the expense will be borne by the Government?

Mr. ROTHSCHILD. Yes, sir.

Mr. ROGERS. Does that mean the civil side of it or does military contribute in that, to? Is that part of the defense budget?

Mr. ROTHSCHILD. No, sir; it is a civil expenditure.

Mr. ROGERS. Civil expenditure.

Do you know what the military expenditure in that particular phase of the operation will be?

Mr. ROTHSCHILD. In the ground-station program?

Mr. ROGERS. Yes.

Mr. ROTHSCHILD. For the first 2 years, that is the total expenditure, Mr. Rogers, military and civil, excepting certain strictly military requirements, such as facilities for their own military bases.

Mr. ROGERS. I see.

Insofar as the planes are concerned and the commercial airlines, they will not participate in this expenditure, will they?

Mr. ROTHSCHILD. No, sir.

Mr. ROGERS. The only expenditure that they will have to participate in will be the providing of equipment on their aircraft?

Mr. ROTHSCHILD. That is correct, sir.

Mr. ROGERS. In order to work in connection with this?

Mr. ROTHSCHILD. That is correct.

Mr. ROGERS. Has any thought been given, Mr. Rothschild, to requiring the airlines to participate in the cost of the equipment, the ground equipment?

Mr. ROTHSCHILD. You are a little ahead right there, Mr. Rogers.

Yes, a great deal of thought has been given to the establishment of user charges. Whether these charges would include the furnishing of equipments or merely the cost of the operation of those equipments once they have been installed is still a matter that is under study. The nature and extent of the participation by users is also under study. We have a very complicated situation. About half of all the flying that is done over the United States is done by the military and the military uses every one of the civil aids to fly.

Now, the other half is done partially by the commercial airlines, partially by the business aircraft, and partially by private fliers. There are very many different ways of measuring the use that each one gets out of the facilities available to them. If you measure it in terms of aircraft, you get one result; if you measure it in terms of aircraft miles of operation, you get another. And if you measure it in terms of passengers carried, you get still another one, and if you measure it in terms of fuel conusmed, you get still another answer.

So this is all under study and I am sure that we shall at some time be coming to you with proposals for establishing just and reasonable user charges in this field.

Mr. ROGERS. Thank you, sir.

Mr. ROTHSCHILD. Thank you.

Mr. HARRIS. Thank you very much, Mr. Secretary.

Again I want to express on behalf of the committee our thanks and our commendations to you and your organization.

Mr. ROTHSCHILD. Thank you kindly, Mr. Chairman.

Mr. HARRIS. Dr. Furnas?

Dr. Furnas, you are the Assistant Secretary of Defense, and Chairman of the Air Navigation Development Board?

STATEMENT OF DR. C. C. FURNAS, ASSISTANT SECRETARY OF DEFENSE, RESEARCH AND DEVELOPMENT, AND CHAIRMAN, AIR NAVIGATION DEVELOPMENT BOARD

Mr. FURNAS. That is correct, Mr. Chairman.

Mr. Chairman, since this is the first time that I have appeared before this body, if you like, I could give a very brief biographical sketch.

Mr. HARRIS. We would be very glad to hear about it.

(The information referred to follows:)

CLIFFORD C. FURNAS, ASSISTANT SECRETARY OF DEFENSE (RESEARCH AND DEVELOPMENT)

Dr. Clifford C. Furnas, chancellor of the University of Buffalo, was appointed by President Eisenhower on November 22, 1955, to be Assistant Secretary of Defense (Research and Development) and was sworn in on December 5. Dr. Furnas, who is on leave from the university, succeeded Mr. Donald A. Quarles, who became Secretary of the Air Force on August 17.

From 1946 until September 1, 1954, when he became chancellor, Dr. Furnas was director of the Cornell Aeronautical Laboratory, Buffalo, N. Y. He served the Department of Defense research and development organization that he will now head in a consultant capacity and had been associated with its predecessor organization, the Research and Development Board, in various capacities since February 1948. Under Reorganization Plan No. 6 of 1953, the Research and Development Board was abolished and the position of Assistant Secretary of Defense (Research and Development) was established to take its place. From February 1954 until he became Assistant Secretary, Dr. Furnas was Chairman of the Technical Advisory Panel on Aeronautics of the Office of the Assistant Secretary of Defense (Research and Development) and prior to that was a member of the Committees on Aeronautics and Guided Missiles of the Research and Development Board, serving as Chairman of the latter Committee from September 1952 until he accepted the chairmanship of the Panel on Aeronautics. Dr. Furnas, who has been serving as a member of the Committee on Aircraft Construction of the National Advisory Committee for Aeronautics, became a member of the NACA itself by virtue of his position as Assistant Secretary of Defense.

During World War II, Dr. Furnas served with groups of the National Defense Research Committee of the Office of Scientific Research and Development that were concerned with physical, chemical, and chemical engineering problems.

Dr. Furnas was born in Sheridan, Ind., on October 24, 1900. He was graduated from Purdue University in 1922 with a bachelor of science degree and did part-time graduate work at Carleton College during the next 2 years. In 1926 he received his doctor of philosophy degree from the University of Michigan.

While in school he was a long-distance runner of distinction. He competed in the 5,000-meter event at the Olympic games in Antwerpt in 1920 and in 1922 was awarded the Big 10 Conference medal for the best combined scholastic and athletic record.

Immediately after leaving Purdue, Dr. Furnas was track coach and mathematics teacher at Shattuck School, Faribault, Minn. He was a research chemist with the United States Steel Corp., during the summers of 1924 and 1925. He did his graduate work at the University of Michigan in 1924–26. As a physical chemist with the United States Bureau of Mines from 1926 to 1931, he conducted research on metallurgical processes. In the latter year he joined Yale University as associate professor in chemical engineering and continued to serve as an industrial consultant. During the summer of 1938 he was a research associate with the Bureau of Educational Research in Science and during the following summer was a lecturer for the Bureau at Teachers College, Columbia University.

While Dr. Furnas has conducted a great deal of research in the fields of process metallurgy and physical chemistry, he has specialized in fluid flow, heat transfer, combustion, and other phases of research related to the aviation field. During his wartime service with the National Defense Research Committee, he served with a group that was concerned with the research and management of the oxygen program of NDRC.

In February 1943 Dr. Furnas became director of research for the research laboratory of the Curtiss-Wright Corp., Buffalo, N. Y. When the corporation gave its airplane division research laboratory to Cornell University on January 1, 1946, he headed it as director of the Cornell Aeronautical Laboratory.

Under the direction of Dr. Furnas, the laboratory, a self-sustaining affiliate of Cornell University, came to be unique among private institutions in the breadth and comprehensiveness of its operations. Although the center of interest is in applied research in the aeronautical sciences, it carries on a substantial amount of fundamental and exploratory research and also fulfills broad educational and public service functions.

During Dr. Furnas' last year with the laboratory, its broad range of activities covered over 140 active projects, and 315 technical reports summarizing the work were issued. Among these projects was one for a $1.9-million transonic modification of a large wind tunnel, jointly financed by the Air Force and the laboratory, to provide increased capabilities in the vital transonic speed range (up to 1,000 miles per hour). Other new facilities completed or started during 1954 included an evacuated spin pit for high-speed propeller research, a whirling arm for research in new jet engines, a 1-square-foot supersonic tunnel, and a new burner laboratory for propulsion studies. Work was also carried on for the Navy in the field of improved systems of combat control for air defense of the fleet in computing and control systems pointed toward all-weather operation of carrier aircraft.

Though research is the prime function of the laboratory, during Dr. Furnas' regime the research-associates program was developed to promote an educational program. In 1954 the program sponsored 8 graduate fellowships and 1 professorship in mathematics at Cornell University and was responsible for the employment of more than 50 students in the laboratory.

In addition to contributing his own services to the national welfare, Dr. Furnas encouraged the active participation of his staff in public-service activities in organizations such as NATO and in various technical groups and committees of the Department of Defense and academic institutions.

In May 1954, 13 months ahead of schedule, the laboratory made the final payment of a large loan, making it entirely free of debt.

Dr. Furnas is a member of the American Institute of Chemical Engineers, the American Chemical Society, the Newcomen Society, Sigma Xi, Tau Beta Pi, Phi Lambda Upsilon, Theta Chi, and a fellow of the American Association for the Advancement of Science and the Institute of Aeronautical Science. Clubs to which he belongs are the Cosmos Club (Washington, D. C.), the Chemists (New York), Saturn (Buffalo), the Buffalo Club, and the Country Club of Buffalo.

In addition to being the author of a large number of technical articles, Dr. Furnas has also written several books, including America's Tomorrow; The Next Hundred Years, a Book-of-the-Month-Club selection in January 1936; Man, Bread, and Destiny, written with his wife; and the Storehouse of Civilization. He was editor of the 1942 edition of Roger's Manual of Industrial Chemistry and of the 1948 Industrial Research Institute monograph of Industrial Research—Its Organization and Management.

Dr. Furnas will be on leave from the University of Buffalo from December 1, 1955, to February 1, 1957. He and Mrs. Furnas will reside in Washington. Their daughter, Mrs. Carl B. Pollock, Jr., and her husband reside in New York City where she is working toward a doctor of philosophy degree in microgenetics at Columbia University.

Mr. FURNAS. Well, my educational background is that of a chemical engineer with undergraduate work at Purdue University and doctor's degree from the University of Michigan.

My professional experience includes work with the United States Steel Corp., 5 years with the United States Bureau of Mines, 12 years as a professor of chemical engineering at Yale University.

During the war period, from 1941 to 1943, I was primarily in Washington with the Office of Scientific Research and Development. In 1943 I became director of the Curtiss-Wright Aviation Research Laboratory, which at the end of the war was given to Cornell University, and at that time, that is, in 1946, became the Cornell Aero-

nautical Laboratory. I was director of that laboratory, the Cornell Aeronautical Laboratory, until 1954 when I became chancellor, which is the president, of the University of Buffalo.

I am here at the present time on leave as chancellor of the University of Buffalo, having been sworn in as an Assistant Secretary of Defense for Research and Development on December 5, 1955, and I was appointed Chairman of the Air Navigation Development Board in March of 1956.

Mr. HARRIS. Doctor, thank you very much. We are very glad to have such an important person as yourself with such an outstanding background. It certainly eminently qualifies you for your position of responsibility in Government.

Did you take Dr. Quarles place?

Mr. FURNAS. Yes.

Mr. HARRIS. You succeeded a fine man.

Mr. FURNAS. I certainly did. He is a man for whom I have a great deal of admiration.

Mr. HARRIS. He is a man from Arkansas, incidentally.

Mr. FURNAS. Should I proceed with my prepared statement, Mr. Chairman?

Mr. HARRIS. Yes; you may proceed.

Mr. FURNAS. Mr. Chairman, I am assuming the members of your subcommittee were informed on the occasion of the previous hearings in March and April 1955 about the formation, the authority, and the responsibility of the Air Navigation Development Board for the development of the common system of air navigation and traffic control. Hence my statement is intended to inform you about the current status of the Board's development program and the plans for the future.

Testimony at the present hearing has covered the operational aspects of air navigation and air traffic control, and outlined in detail the problems we have at the present time and the plans of the CAA to achieve maximum use of our presently available equipment.

The Air Navigation Development Board is active in the development of an improved and increasingly safe common system.

Although it may seem a little elementary, I thought my best approach to tell you of the highlights of our activities is to outline a truly ideal system based on the requirements of SC–31, SWG–5 and other pertinent documents, and then point out where our developments are taking place to achieve an approach to this ideal system.

The requirements of a truly ideal system could be very briefly condensed down to the following five points:

1. The pilot would have instantaneous and truly exact information on his position in space, relative to fixed points on the ground, his heading and his speed.

2. His position, heading, that is, direction, and speed relative to all other aircraft in the vicinity.

3. At least one ground center would have this same information of position, heading, and speed for all aircraft within its area of responsibility.

4. The ground center would exercise control by taking all this information and making decisions, and

5. Instruct and/or command particular aircraft to make appropriate changes in altitude, heading, or speed.

Further, such an ideal system would allow the individual pilot to use his judgment on heading, altitude, and speed, for maneuvering through thunderstorms, for instance, as long as it did not lead to dangerous situations or interfere with the functioning of the complete system.

This ideal system would be able to handle a very large number of aircraft in all kinds of weather with complete safety, reliability, and without delays. These aircraft would be of widely varying speeds, maneuverability, and ability to hold. It would be able to shift its operation quickly to care for emergency situations of an occasional aircraft in trouble.

Further, this ideal system would be a common system, one which would be considered adequate and completely acceptable to all interests and all operators, military and civilian.

As we all well know, we are very far indeed from that ideal, including the complete acceptability of all parties. Perhaps we will never achieve it, but it is a matter of paramount importance for the Nation to accelerate the development of an improved air navigation and traffic control system as rapidly as it can.

Because of the obvious complexity of the problem, progress is necessarily slow and also expensive. The various approaches to improving our air navigation and control also involve certain compromises, which are not necessarily undesirable.

For instance, the flight regime is divided into three portions or phases:

En route, terminal, and landing.

As a practical matter, the accuracy of information and fineness of control do not need to be as great for the en route phase as for the terminal and landing.

Further, by retaining two types of flight rules—visual-flight rules, VFR, and instrument-flight rules, IFR—we rely on the eyes and judgment of the pilot whenever it is reasonable to do so.

Many agencies, organizations, and individuals are working toward improvements in the systems. Though the Air Navigation Development Board, ANDB, is but one of many which are involved, I should like to run quickly through each of the five idealized requirements, indicate where we stand now, what the means and prospects of improvement are, and where appropriate, indicate the role and status of the ANDB program.

Now I have here a chart outlining these 5 points, but in the material which has been given you there is a sheet in the back of the attachments which is also this particular outline of the 5 requirements.

We will turn attention first to requirement No. 1, which is pilot information relative to the ground—where he is, where he is headed and how fast relative to the ground—and I have listed in the sheet here the ways we have presently of the pilot getting that information, and also the anticipated.

When we look at the facilities available to furnish the information the pilot needs relative to the ground, requirement No. 1, we find that we presently have in use low frequency radio ranges and VOR's, very high frequency omnidirectional radio ranges. These give the pilot the direction or the azimuth that he is heading, as the major navigational aids in the en route area of flight.

A recent decision, of August 30, 1956, of the Air Coordinating Committee, ACC, which Mr. Rothschild so ably told you about, makes the so-called VORTAC system the major common system navigational aid.

The use of VORTAC, azimuth or heading, on the airways makes azimuths, that is, direction of heading, and distance information available to the pilot to meet both civil and military requirements for instantaneous position fixing.

If I might digress a moment to discuss with you briefly the Air Navigation Development Board work with TACAN and the consideration of its use as a common system navigational aid.

You are familiar with a great deal of the history of TACAN, and the fact that it was referred to ANDB by the Assistant Secretary of Defense, Research and Development, memorandum of December 24, 1953.

The objective of ANDB was to assemble and analyze the factual information to determine the extent to which the VOR/DME, distance measuring equipment, and the TACAN systems meet, or could be made capable of meeting, the technical and operational aspects of military requirements and common system requirements. The matter was referred to ANDB Advisory Committee No. 1, and three expert consultants retained by the Board.

The split report of Committee No. 1 and the consultants' report are a matter of record with this committee. We are indebted to the consultants for their effort on the TACAN system, which caused it to fulfill its early engineering promise.

The ANDB met on January 28, 1955, and considered the ANDB Committee No. 1 report, along with an ad hoc group report on an alternate system of air navigation consisting of present civil DME and the addition of an azimuth system in the 1365–1660 megacycle band.

Because of the expense and a delay of approximately 3 years which would have been involved in common system implementation, this alternate system was not favored by ANDB as first choice. This is where the Board found itself in a perplexing situation, which is perhaps an understatement.

Neither VOR/DME nor TACAN nor the best alternate system was acceptable to everyone.

At this point the Board decided that the unknown factors about TACAN should be resolved. The matters to be explored included:

1. A determination of the actual number of TACAN channels available to the common system for implementation purposes.
2. The number of channels required to implement the common system.
3. The relationship of TACAN to the continental air defense plans.

There were many other detailed technical problems, but those were the outstanding ones.

The ANDB studied the unknowns, and the following answers were arrived at:

1. There are 116 TACAN channels available for common system and military use.
2. There is a requirement for 100 channels of TACAN to implement the common system as envisioned in 1965.

3. TACAN is considered an integral part of the continental air defense plans.

With the unknowns resolved, ANDB was in a position to forward a statement on TACAN to the Air Coordinating Committee. This matter was considered at the March 16, 1956, meeting of the ANDB, and on March 31, 1956, ANDB formally answered ACC paper 59/58.1, revised. An unclassified version of the ANDB letter is furnished for the record.

Mr. HARRIS. I have read this letter, Doctor. It contains a great deal of information which you are explaining here. I believe it would be helpful to have the letter included in the record.

Mr. FURNAS. We will submit it for the record then.

(The letter referred to follows:)

[Air Navigation Development Board Release, July 20, 1956]

(This is an incomplete letter. Text relating to information which has security classification has been removed.)

CHAIRMAN, AIR NAVIGATION DEVELOPMENT BOARD.

Hon. LOUIS S. ROTHSCHILD,
Chairman, Air Coordinating Committee,
Department of Commerce Building,
Washington, D. C.

DEAR MR. ROTHSCHILD: Reference is made to Air Coordinating Committee letter dated April 25, 1955, and to your letter of May 3, 1955, transmitting the Air Coordinating Committee's official action in regard to the United States program on electronic short-distance navigation systems (ACC 59/58.1 (revised*)). The approved program set forth in appendix A of this paper included requests to the Air Navigation Development Board regarding the common system development program, and was particularly concerned with uncertainties involved in the proposed TACAN system.

The Air Navigation Development Board has completed its investigations of the questions concerning TACAN requested by the Air Coordinating Committee. At its March 16, 1956, meeting, the Board reviewed the results of its findings and agreed that the uncertainties formerly associated with TACAN had been resolved sufficiently so that the matter can again be referred to the Air Coordinating Committee. It is the purpose of this letter to acquaint you with these findings, and to suggest a possible course of action based on them. For purposes of easy reference, the findings are numbered to correspond to the requests in appendix A to ACC 59/58.1 (revised*).

I.C.1.a. *The actual number of noninterfering channels which are available to TACAN*

One hundred and sixteen channels are available.

Reference is:

I.C.1.b. *The number of TACAN channels required*

(1) For the common civil/military system: One hundred and twelve channels are required, including 12 channels for military tactical use. This requirement assumes that 100 channels will be necessary to provide the full coverage service from 700 feet above terrain to 75,000 feet mean sea level in the continental United States. Four additional channels remain for contingency use.

References are: Common system short range navigation coverage requirements as determined and set forth in Common System Coverage dated September 1, 1955, prepared by ANDB Advisory Committee No. 3.

The determination by the National Bureau of Standards of the number of channels required to implement Tacan facilities, at the sites specified in the report Common System Coverage, in National Bureau of Standards' letter dated March 23, 1956, file 83.60.

(2) For the interim tactical system: The number of Tacan channels required for the interim tactical system has not been determined by specific analysis nor formally confirmed. Informal discussion, however, with representatives of the

National Bureau of Standards indicates that 52 channels will be adequate for this use. These channels are included in the total required for facilities in the continental United States.

I.C.1.c. *The relationship of Tacan to the continental air defense plans*

I.C.2. *Development of Tacan for possible common system applications*

In fiscal year 1956, the Air Navigation Development Board established a project at the CAA Technical Development Center to develop the Tacan beacon, i. e., the ground facility for use on the Federal airways.

A study of the military Tacan beacon is in progress, and steps are being taken to provide the components required to assemble an engineering model of a ground facility, including single phase antenna spin motor, single phase high voltage power supply and blower motors, and monitor unit with automatic switchover to a standby beacon. Depending on deliveries of these equipments, it is anticipated that the Technical Development Center will have the necessary components and will assemble an engineering model in early fiscal year 1958. The Technical Development Center is proceeding also to prepare a specification for a common system Tacan beacon prior to evaluation of the engineering model. This specification is 70 percent completed. Completion by June 1 of a draft of the specification for Federal airways coordination is expected.

I.C.3. *Studies to determine technical feasibility of an alternate rho theta system*

This study has been completed and distributed to all the ANDB member agencies. Informal discussion with agency representatives indicates that this plan has not been considered seriously because it has been interpreted as being a backup in the event Tacan failed to qualified. This study will be forwarded under separate cover as was requested by the Air Coordinating Committee.

I.C.4.a. *Improving low altitude coverage and minimizing site preparation of the VOR/DME*

In fiscal year 1956, the Air Navigation Development Board established a project at the CAA Technical Development Center for the purpose of developing and evaluating means for the accomplishment of these objectives. To date, the following phases of the program have been completed:

a–1. A plot of wooded land near Indianapolis, considered to be unsatisfactory and difficult to use as a site for a VOR facility, has been leased.

a–2. A low tower VOR has been installed in a small cleared area of the wooded site. Flight tests have been made to gather data on the performance of the low antenna facility. Later, these data will be compared with data obtained when the antenna is supported by a 200-foot tower.

a–3. A 200-foot tower with a 60-foot diameter solid counterpoise has been completed and a 4-loop VOR antenna installed thereon. It is expected that flight tests of the high tower configuration will begin shortly, and that a comparison of the performance of these two installations at the same site will be available before the end of the fiscal year.

Contingent on the results of this work, the next phase will be to develop a stacked array VOR antenna for installation on the tower.

I.C.4b. *Coaxial colocation of the VOR and TACAN antennas and of the VOR/DME and TACAN antennas*

This study, assigned to the Rome Air Development Center, Griffiss Air Force Base, New York, has been completed, and was reported upon in December 1955. Results of this study indicate that coaxial colocation is technically feasible, although operational questions may arise. These questions concern maintenance and planned shutdown periods, and apparently are readily resolved. A separate report was made on the colocation study by letter to the Air Coordinating Committee on January 12, 1956.

I.C.4.c. *Converting civil DME ground equipment to serve as low powered Tacan terminal facilities*

A study has shown it is more feasible to modify the DME to give distance information only to an airborne TACAN set, rather than both distance and azimuth. A civil DME ground equipment (DTB) is being modified to prove the practicality of providing distance service to an airborne TACAN set. It is anticipated that a report can be made on this matter within the next 30 days.

In summary, the Air Navigation Development Board, at its seventh meeting, January 28, 1955, agreed to a five-point course of action, which was intended to clear the way for the adoption of TACAN as the common short distance navigation system, provided the answers to certain unknowns were forthcoming. The Board now finds that the unknown factors have been satisfactorily resolved and can now state that TACAN is technically suitable as a common system component. Some thought has been given to steps that could be taken which would allow a transition to TACAN as the common civil/military navigation system, and such a plan is outlined in an attachment to this letter, as one possible solution.

In the Board's opinion, it is of the utmost importance that we proceed immediately on a course which will provide distance measuring service which will be available to meet the requirement that will be imposed by civil/military jet operations. The ANDB staff is undertaking, as a matter of expedited action, a study of three possible approaches to obtain TACAN distance measuring service.

The above answers to the specific requests made of the Air Navigation Development Board are as complete as can be given at this time. Additional information pertaining to the above will be furnished as it becomes available. Please be assured of the Board's continuing interest in this matter and sincere desire to be of assistance wherever it can be helpful.

Sincerely yours,

DONALD A. QUARLES.

Attachment: ANDB paper No. 56–13, revised March 31, 1956.

[Air Navigation Development Board release July 20, 1956]

(This is an incomplete report. Text relating to information which has security classification has been removed.)

AIR NAVIGATION DEVELOPMENT BOARD, WASHINGTON, D. C.

ANDE Paper No. 56–13.
March 16, 1956.
Revised Mar. 31, 1956.

PLAN OF ACTION INVOLVING TRANSITION AND FINAL USE OF A COMMON NAVIGATION SYSTEM

There follows, a plan of action which can be implemented at an early date for making TACAN the common system navigation aid. This plan allows maximum use of Government expenditures already made, and is inconvenient to the least number of persons. Detail has been avoided in this plan of action, but reference is made to documents where greater detail and supporting data can be found.

The steps are:

1. Decide to adopt TACAN: Realizing that the Air Navigation Development Board cannot make this decision, the Board is nevertheless taking the required first step by deciding that TACAN meets the criteria for the common system; that the "uncertainties" concerning coverage requirements, channels available, and the compatibility of TACAN with air defense ground environment, have been resolved satisfactorily and in favor of the adoption of TACAN.

References are: National Bureau of Standards' letter dated March 23, 1956.

2. Convert existing civil distance measuring equipment ground stations (called DTB) from pulse multiplex to clear channel (TACAN) DME: This change will permit these stations to work with the airborne TACAN set (ARN–21), and provide distance information to the user. This is necessary to provide distance service to those desiring it in the near future and satisfy the airline requirement for distance measuring service to jet airliners in 1959. Additionally, this permits smooth transition to a complete TACAN navigation system. VOR and compatible DME would be the temporary system.

To prove (or disprove) the technical and operational practicality of this modification, a DTB is being furnished Federal Telecommunication Laboratories so that it can be changed to provide distance measuring service to a TACAN airborne set (ARN–21).

Also being considered to provide compatible distance information is the use of URN–3's. The better of these two methods will be recommended by the ANDB technical group now meeting on this determination.

3. CAA's technical development center to contract for a new TACAN ground set (complete) to include changes discussed and agreed to in the interagency meeting of February 13, 1956. These changes are being incorporated in the specification directed on February 16, 1956, to the technical development center.

This step is designed to furnish a TACAN common system characteristic and production specification for the TACAN ground beacon system by fiscal year 1960.

Reference is: Minutes of ANDB interagency meeting dated February 13, 1956.

4. Agree on coaxial colocation of VOR and TACAN; Technical agreement has already been reached on the feasibility of this step, but operational questions may arise.

This step is of importance economically and is vital to traffic control.

References are: Rome Air Development Center report dated December 1955 title "Colocation of TACAN and VOR/DME." Minutes of interagency meeting, ANDB, February 13, 1956.

5. Review the military TACAN airways plan: A review should be made because this plan can and should constitute the initial phase of the TACAN common system. This review should not prejudice the installation of military TACAN air routes to provide mobility and terminal facilities for military aircraft. Desirable changes may be found here which will be more suitable to TACAN expansion, considering the use of compatible DME for navigation and traffic control purposes. Additionally, it will be advisable to locate some of the TACAN ground stations on 100-foot towers to insure better coverage and to get a broader sample of how this equipment works from elevated locations.

6. Solicit aid from airborne DME owners of record on the TACAN decision date to evaluate capability of compatible DME in conjunction with VOR, as the transition common system: This step suggests furnishing an ARN–21 to the DME owners of record of this date and will allow training of pilots and controllers in using distance information as a traffic control aid. Operators installing the ARN–21 under this plan would get navigation information from the VOR and compatible DME, as well as with TACAN operating in conjunction with the 210-station military program. Those carrying the ARN–21 in civil aircraft will aid in the navigation evaluation program, and will also constitute a large pool of knowledge from which requirements for the civil rho theta equipments that must be developed, can emanate. Approximately 350 ARN–21 units will be required for this step.

7. Develop a common TACAN system standard: This step is required so that system accuracy will not be sacrificed due to possible short cuts of competitive manufacturers of civil equipment. Minimum accuracy standards can be anticipated in the foreseeable future as a part of CAA and CAB regulations. Derogation of accuracy standards can be prevented if action is taken at the beginning of the use of TACAN as a common system aid. It is understood that the military departments are in the process now of developing a TACAN system standard. Civil agencies should be invited to participate in the preparation of this standard so that the present effort can produce an agreement adaptable for the common system and which will protect the intended accuracy.

8. Develop TACAN airborne units for civil use: In view of step 7 of this plan, it would appear that it is a Government responsibility to underwrite the development of such TACAN civil airborne gear as may be required. At this time, it is not clear what these units should be, but under consideration should be:

(*a*) A complete TACAN installation of two types:

(1) A version for airline and large business and private aircraft use.

(2) A version for those whose requirements are less rigid and which would be sold at less cost than (1) above, but whose accuracy would be within system standards.

(*b*) A TACAN azimuth-only set in two versions as described in (*a*) above.

(*c*) A TACAN distance measuring set in two versions as described in (*a*) above.

In outlining the above steps, no attempt has been made to associate them with specific agencies for accomplishment. It appears that the Air Coordinating Committee, the Civil Aeronautics Administration, and the Air Navigation Development Board are all involved in these steps, however. The Air Navigation Development Board is well aware of the development actions that are necessary to the successful completion of the plan, and will undertake these projects when general agreement is reached.

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Mr. FURNAS. As you have heard in previous testimony, the ACC acted to recommend the system of VOR for azimuth and TACAN compatible DME for distance measuring, with TACAN azimuth also furnished for military use, this system to be officially known as VORTAC.

This is a sound decision, and the ANDB stands ready to consider any development work necessary to the implementation of the program, such as colocation and possible development of low-power, clear-channel DME sets for ground use in some service such as ILS, instrument landing system, and other low-power azimuth facilities.

Meanwhile, we are preparing, for the use of industry and the implementing regulatory bodies, a common system component characteristic for VORTAC. This describes in detail the signal that will be used and its embodiment in equipments to make up a system. It will also be the guide for the United States position on the changing of the DME standard in the International Civil Aviation Organization, ICAO.

If I may now return to my explanation of the overall ANDB development program, still on requirement No. 1, pilot information relative to the ground, I would like to point out that, in the en route area of navigation, there are in development within the military departments self-contained systems and the long-distance radio aid known as NAVARHO.

NAVARHO is a low-frequency system not involving any frequencies used by VORTAC, which will furnish both azimuth and distance information out to a distance of approximately 2,000 miles. It is now being evaluated by the Air Force and has been recommended in ICAO as the most promising international long distance navigation radio aid. This extends out beyond the use of the VORTAC system. The VORTAC is for shorter range.

In the terminal area, we now have TVOR's, terminal VOR's, the ILS instrument landing system, and GCA, ground controlled approach, radar. These are all part of this terminal landing, still requirement No. 1.

We have some interesting equipment developments for use in the terminal area that will enhance the safety and reliability of all-weather operations, as well as increase the number of movements possible in a terminal area.

The Air Force is evaluating the radar computer AN/GSN–3, VOLSCAN, volumetric scan, equipment for semiautomatic control of aircraft in terminal areas, and the AN/GSN–5 for the final approach and landing of aircraft under low-visibility conditions.

The ANDB is carefully following and participating in these tests and evaluation to determine possible application in the common system.

On the chart which I have given you, these items, the ones with one cross after them, are the ones ANDB are directly involved in, and with two crosses are those military and other developments in which ANDB is coordinating and helping out.

The ANDB and the Air Force have participated in the automatic ground controlled approach system known as AGCA, and this is

being evaluated by the Air Force as another possible system for use in final approach and landing. In this area, we are all indebted to the Navy development of the AN/SPN–10, carrier-based landing system, which was the forerunner of the AN/GSN–5.

Now to return to requirement No. 2, where the pilot needs information relative to other aircraft, we find that at the present time he does this visually and by listening to the voice radio, both in the en route and the terminal areas.

ANDB has reviewed collision and proximity warning devices proposed from several sources, and has taken into consideration the recent RTCA, Radio Technical Commission for Aeronautics, requirements for a proximity warning device.

It is fully recognized that in this area it is difficult to write a requirement which has a possibility of being fulfilled, and it then becomes difficult to decide what technical approach can be used to fulfill even a part of the requirement. ANDB does not see a ready answer to this problem.

However, we are following all developments closely, and we do have in our program a proposed use of the radar safety beacon as a collision-warning device.

I will say more about the radar safety unit in a moment.

This would be an additional function and, up to this time, has not been funded, due to the higher priority of getting the original beacon working as proposed by the Joint Communications-Electronics Committee, JCEC, and the ACC.

When we come to requirement No. 3, ground determination of aircraft position, et cetera, we find that the ground information on all aircraft in the en route area is obtained by the pilots reporting over radio fixes or other geographical points.

We can visualize here that in the near future the en route area will have, and in some instances does now have, surveillance radar. Our need here is for improved radars, better displays, and faster methods of transmitting information.

This is where the radar safety beacon, developed as a high-priority item by ANDB and now ready for evaluation, will serve a very useful purpose. By sending back to the ground radar an amplified pulse, the beacon gives a more positive return from equipped aircraft than the primary radar would otherwise receive, and can also provide identification of the aircraft by having the aircraft answer with a coded reply to interrogation from the ground.

ANDB is also involved in studying and evaluating the integration of information and use of equipments used in the SAGE, semiautomatic ground environment, system for air traffic control. This system, as you know, is the complex national system of detection, communication, and control being developed for air defense.

The output of this study and evaluation should result in the development of methods to provide an improved en route traffic control. The use of SAGE for both civilian and military purposes offers fascinating possibilities, but it is too early yet to determine whether such a dual-purpose function is feasible or not.

ANDB realizes that the use of radar, either primary or secondary, is not the only method or approach to provide the required information for air traffic control. We know that it is possible to provide from the air information for en route air traffic control by some form of automatic air-ground data link. This problem is known as the air-derived versus the ground-derived information for air traffic control.

We feel that we should have much more information on both methods before any final decision is made on a future system of air-traffic control, and for this purpose ANDB plans to participate during the fiscal year 1957 in a study and equipment project which will include the use of data link as part of a proposed traffic-control system. It may well be that both air-derived and ground-derived information will be used in the ultimate system.

Under the terminal area and approach and landing phase of requirement No. 3, and this is still the phase where the ground needs to know what the plane is doing, we have available for the ground controllers voice reporting by the pilot and a large number of airport surveillance and GCA radars, and, in good visibility weather of course, human sight.

Here again, the present development of the radar safety beacon, which is now being evaluated, may serve as a most useful additional item for the controller, providing him with some identification of each aircraft as well as its distance and azimuth from the control point.

ANDB has been participating for many years in the development of an airport surface detection equipment radar, ASDE. This equipment will soon be tested at Idlewild Airport, and if the tests prove as successful as anticipated, we will have a very useful tool for the control-tower operator in the handling of traffic at large airports on the ground during low-visibility conditions.

Requirement No. 4 concerns the integration of information and the making of decisions preliminary to controlling the traffic. We depend for decision making now on the controller's mind and memory, using some or all of the tools available to him as outlined above.

In this particular activity, which is of paramount importance, very complex, and less glamorous than that activity which takes place in the aircraft, ANDB has in process several developments which will lead to new and better tools for the control centers.

It is, for instance, possible to replace, at least in part, the mind and memory of the controller with very rapid computers, mathematical computers, and magnetic storage devices, and it is also possible to provide automatic transfer of information between centers and between towers and the centers at a much higher rate than can be obtained by the use of voice. Much of this work has been accomplished, or is in progress at the CAA Indianapolis Airways Operations Evaluation Center, and will find its way into airways use in the intensive program of future implementation that is now proposed by CAA.

Requirement No. 5, which also falls under traffic control, calls for the passing of instructions and commands from the ground to the air, and some acknowledgment from the air that such instructions and commands have been received and can be carried out. This activity

is presently all carried on overly crowded voice radio communication channels, and here ANDB is considering, in its future programing, the use of data link and the more extensive use of radar and secondary radar.

With equipment such as this, it will be possible to transmit instructions and commands very quickly through signals other than the human voice. Such commands could be generated by human action or they could be automatic. The commands could be in the form of communications to the pilot or to his instrument panel, or, in the ultimate, command signals to the aircraft controls.

The possibilities are very broad indeed, and even partial use of such equipment should greatly lessen the use of voice communication over the presently available channels, and increase capacity and safety of the system.

I would like to say here, before I leave air traffic control, that ANDB has found that the use of an air traffic control simulator to work out traffic control problems has been a great aid in our better understanding of techniques and equipments required as tools by the controllers.

We have plans for an improved simulator to take the place of the present one at the technical development center of CAA at Indianapolis. This new simulator will be consistent with our needs for simulating more aircraft moving at higher speeds under the control of automatic and semiautomatic equipment.

I would like now to refer back to requirement No. 1 under air navigation, and talk briefly about helicopter navigation, because that is a special problem.

The anticipated rapid expansion in the use of helicopters has caused ANDB to give special consideration to common-system aspects of the navigation aids required for helicopters. With visual flight conditions, these aircraft can be operated with great precision in airspace with surrounding obstructions and land on very small areas. However, at the present time, when instrument-flight conditions occur, the performance of the helicopter is degraded below that of a fixed-wing aircraft on the basis of instrument-flight procedures. This is basically because a really satisfactory autopilot for helicopters has not yet been developed.

ANDB has authorized the Department of the Army to undertake projects to determine, by operational tests, a better understanding of the navigation aid required specifically for helicopter all-weather operations. A precise low-frequency hyberbolic navigation system, trade-name Decca, will be used for this purpose. Investigation will be undertaken in two areas.

The first area is the Signal Corps Electronic Proving Ground located at Fort Huachuca, Ariz. The tests involving Army helicopters and the Decca system will begin this fall and be completed during the winter.

The second is the New York metropolitan area out to a radius of about 70 miles. These tests involving the use of helicopters operated by New York airways, and the system, will begin next spring and be completed in the fall.

On the completion of these flight investigations, ANDB anticipates that projects can be defined for the development of common-system navigation facilities adequate to the needs of helicopter operations in weather conditions requiring the use of instruments.

In summary then of this written report:

1. VORTAC has ben selected as the major common-system navigational aid, and ANDB stands ready to do any development work required during the implementation of the VORTAC system.

2. The ANDB is actively engaged in development and/or evaluation of the following major items for the common system:

A. Airport surface detection equipment, evaluation.

B. TACAN, ground-equipment development and evaluation.

C. Radar safety beacon system, development and evaluation.

D. Helicopter navigation, study.

E. Radar improvements, evaluation.

F. Semiautomatic flight-data storage and processing system, study and evaluation.

G. Integration of air defense systems and air traffic control, study.

H. Air ground data link, study.

I. Simulator, study and development.

3. ANDB is interested in and following the work on the following major pieces of equipment:

A. AN/GSN–3 VOLSCAN, AF, evaluation.

B. AN/GSN–5 approach and landing, AF, development and evaluation.

C. AN/SPN–10, approach and landing, N, development and evaluation.

D. NAVARHO long distance radio aid, AF, evaluation.

E. Improved radars for air traffic control, AF, development and evaluation.

4. This brief report to you contains only the highlights of the ANDB program, and to fully acquaint you with the extensive program of ANDB, I am making available for the record our latest semiannual progress-status report, dated June 30, 1956. This report contains detailed technical and fiscal information on all active projects.

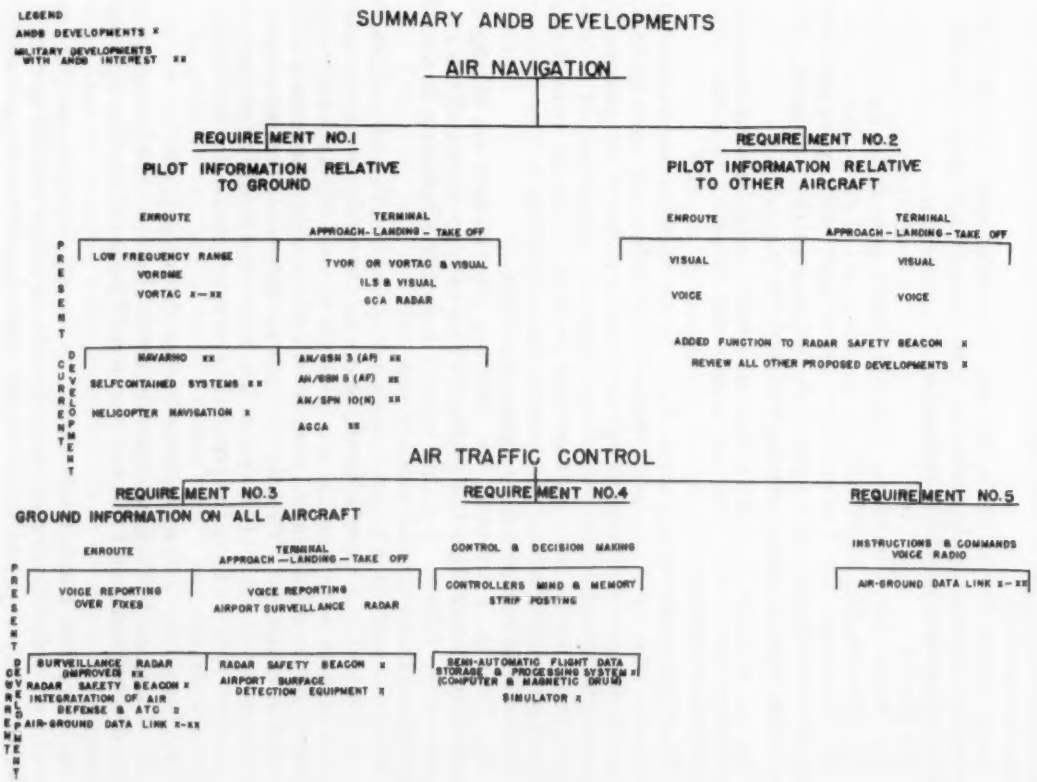
5. A copy of the chart entitled "Summary of ANDB Developments" is furnished for the record.

That, Mr. Chairman, is my prepared statement.

Mr. HARRIS. Thank you very much, Doctor.

We will let the chart referred to be included as part of the record, and we will be glad to receive your semiannual project-status report, which will be of much interest.

(The information referred to follows:)


LEGEND
ANDB DEVELOPMENTS x
MILITARY DEVELOPMENTS WITH ANDB INTEREST xx
SUMMARY ANDB DEVELOPMENTS
AIR NAVIGATION
REQUIREMENT NO.1
PILOT INFORMATION RELATIVE TO GROUND
REQUIREMENT NO.2
PILOT INFORMATION RELATIVE TO OTHER AIRCRAFT
ENROUTE
TERMINAL APPROACH - LANDING - TAKE OFF
PRESENT
LOW FREQUENCY RANGE
VORDME
VORTAC x—xx
TVOR OR VORTAC & VISUAL
ILS & VISUAL
GCA RADAR
CURRENT DEVELOPMENT
NAVAHO xx
SELFCONTAINED SYSTEMS xx
HELICOPTER NAVIGATION x
AN/GSN 3 (AF) xx
AN/GSN 5 (AF) xx
AN/SPN 10(N) xx
AGCA xx
ENROUTE
TERMINAL APPROACH - LANDING - TAKE OFF
VISUAL
VISUAL
VOICE
VOICE
ADDED FUNCTION TO RADAR SAFETY BEACON x
REVIEW ALL OTHER PROPOSED DEVELOPMENTS x
AIR TRAFFIC CONTROL
REQUIREMENT NO.3
GROUND INFORMATION ON ALL AIRCRAFT
REQUIREMENT NO.4
REQUIREMENT NO.5
ENROUTE
TERMINAL APPROACH — LANDING — TAKE OFF
CONTROL & DECISION MAKING
INSTRUCTIONS & COMMANDS VOICE RADIO
PRESENT
VOICE REPORTING OVER FIXES
VOICE REPORTING AIRPORT SURVEILLANCE RADAR
CONTROLLERS MIND & MEMORY STRIP POSTING
AIR-GROUND DATA LINK x—xx
DEVELOPMENT REQUIREMENT
SURVEILLANCE RADAR IMPROVED xx
RADAR SAFETY BEACON x
INTEGRATION OF AIR DEFENSE & ATC x
AIR-GROUND DATA LINK x—xx
RADAR SAFETY BEACON x
AIRPORT SURFACE DETECTION EQUIPMENT x
SEMI-AUTOMATIC FLIGHT DATA STORAGE & PROCESSING SYSTEM x (COMPUTER & MAGNETIC DRUM)
SIMULATOR x

Mr. HARRIS. We want to thank you for this very enlightening statement, giving the activities of the Air Navigation Development Board, and certainly you have a very full program.

This is a very interesting problem. People are involved, nations are involved, and our future certainly depends on the right thing being done in this field.

Large credit should go to you and those who work with you, your associates in this highly technical field, because so much depends on what is done and the decisions made.

Mr. Mack?

Mr. MACK. Mr. Chairman, I would like to pass right at this time.

Mr. HARRIS. Mr. Dolliver?

Mr. DOLLIVER. Dr. Furnas, there are two points in your statement that I would like to refer to and ask for your further comment. One occurs on page 11, where you have this sentence:

> The use of SAGE for both civilian and military purposes offers fascinating possibilities, but it is too early yet to determine whether such a dual-purpose function is feasible or not.

That statement creates some doubt in my mind, since some of the witnesses who have hitherto appeared in this hearing have indicated that there was every probability, not possibility but every probability, that the semiautomatic ground environment system would be coordinated for use by both military and civilian. You say it offers fascinating possibilities but you have no determination.

I would like to have an enlargement on that.

Mr. FURNAS. I presume, Mr. Dolliver, the reason I am taking the possibility rather than the probability is because essentially I am a conservative fellow. I rather hate to designate something as a probability unless it is almost a sure thing.

What is involved is largely a number of technical aspects which are quite detailed and quite difficult, and also the problem of the operational aspects as to whether or not to tie up and to adapt the system to air-traffic control would lessen its effectiveness on the matter of the air defense aspects. This we will not be able to determine until the development of the SAGE system has gone considerably further.

Against that we have the possibility of interference for its real purpose of defense.

Mr. DOLLIVER. You mean interference electronically?

Mr. FURNAS. Not interference electronically but interference in the type of equipment and the way you would have to have the operators working.

On the other hand, there would be the other argument that you should go possibly to very great lengths to adapt SAGE system for civilian, and our peacetime air-traffic control simply to keep the whole system in practice and to keep people properly trained.

My own opinion is that there is a high probability that we will use at least some elements of SAGE system, but whether or not we can take it over in toto as presently conceived and use it for the backbone of our national peacetime air-traffic control, I still think is an open question.

I do not believe we should make any flat statements at this time that there is a high probability that it will be done. I think it is physically possible. This does not mean necessarily that it is going to be feasible, everything considered.

Mr. DOLLIVER. Is it fair to say then that the Air Navigation Development Board is seriously considering the possibility of using the SAGE system for civilian aircraft?

Mr. FURNAS. Yes, sir; that is correct.

Mr. DOLLIVER. But have not yet come to any complete conclusion about it?

Mr. FURNAS. That is correct, sir.

Mr. DOLLIVER. Is it further fair to say that your attitude would be to try to develop the SAGE system so that it could be used civilianwise as well as militarywise?

Mr. FURNAS. Yes, sir; that is correct.

Mr. HARRIS. Would the gentleman yield on that point?

Mr. DOLLIVER. Yes, I do.

Mr. HARRIS. Is there anything in connection with the SAGE program that is so highly classified that prevents consideration of its use in connection with the civil-aviation program?

Mr. FURNAS. At the present time, yes, that is true in the development phase. This, of course, might be one of the aspects that would at least prevent or deter its use. There might be some aspects of its operation that would still be kept classified.

However, in general, when a weapons system or any part of it comes into tactical use, and this really would be in tactical use, it does become classified because information does have to be made available to so many people that there is no point in trying to keep it classified. But this classification aspect would be one of the factors that might prevent its use.

At the present time, while still under the development phase, there is a lot of classified work.

Mr. DOLLIVER. Is it not true, too, Doctor, that some of the uses for which the SAGE system is designed are quite apart and separate from any conceivable civilian or commercial use?

Mr. FURNAS. That is correct, sir.

Mr. DOLLIVER. That there are some phases of the semiautomatic ground environment which sort of overlap or mesh in with a commercial use of the equipment?

Mr. FURNAS. That is correct.

The phase of the SAGE system which would be valuable would be first the information gathering. In other words, it will be a comprehensive system by radar determining all objects in the area. Then part of it will be the identification of them. Then it will have computers that will predict where they will be at a certain time and as, for instance, it might be possible in the use of some of this collision work as to whether or not they are headed for a mountain.

However, for your civil control, you would begin to vary it somewhat because the SAGE system is primarily designed to instruct either manned interceptors or missiles to go up and get that particular object in the sky after someone has made the decision to do so. So that you would have an entirely different control system to guide an airplane, let us say in the Chicago airport which would have to be integrated into the SAGE system because it is not the present purpose of the SAGE system to guide the airplane into the Chicago airport.

Mr. DOLLIVER. Would not the entire communication phase of the SAGE system be valuable?

Mr. FURNAS. That would be one of the most important parts.

Mr. DOLLIVER. As well as military?

Mr. FURNAS. Yes, if we do adapt it for civilian use.

Mr. DOLLIVER. The next sentences that I would call to your attention occurs on page 14, at the top of the page, referring to aircraft control in the air.

> Such commands could be generated by human action, or they could be automatic. The commands could be in the form of communications to the pilot or to his instrument panel, or, in the ultimate, command signals to the aircraft controls. The possibilities are very broad indeed, and even partial use of such equipment should greatly lessen the use of voice communications over the presently available channels, and increase capacity and safety of the system.

Is that what is popularly called complete automation of aircraft operation control?

Mr. FURNAS. If you carried it to the ultimate, it would be complete automation, which is what you have in the guided missile. There are various ways of commanding it, but they all involve this matter of automatic control.

Now, the decision of how the guided missile, where it should go and what direction, it may involve human judgment or it may be entirely by machine. Automatic devices, including computers which will compute out what the change in course of the missile should be so that it will intercept a certain airplane flying in the sky, that is the complete automation and that would be the ultimate possibility.

I am not suggesting that this should be, at least in the foreseeable future, applied to that degree of automatic airplane operation. I am simply saying that this is the ultimate possibility.

Mr. DOLLIVER. Is there any possibility at the present time, or probability at the present time, for applying such automation to impending collisions in the air, which is the impetus behind these hearings?

Mr. FURNAS. I feel that is a possibility in the future. As to how distant a future, I would hesitate to say.

The first phase on the approach of collision in the air will be to warn the pilot, No. 1, that there is something in your vicinity.

No. 2, that it is about here and going about such and such a direction.

The third thing should be an indication to him that in order to avoid this collision you should turn to the right or left or go up or down. This involves a good deal of automatic processing information; in other words, a computer to judge the course of the two aircraft in order to give you those instructions. Ultimately, you could possibly tie that to automatic controls in the aircraft and thus not having the human judgment enter in.

However, this of course, becomes complicated and expensive. I am just outlining what the ultimate possibilities would be.

Everyo one of these things adds complications and cost and so they should be judged from the feasibility point of view as to whether or not they should be adopted. We have to wait until the state of the art catches up to meet these problems.

Mr. DOLLIVER. Is there any such device now for automatically taking a plane off course to avoid collision with a movable or immovable object? Is there any such device in existence now which will automatically perform that function?

Mr. FURNAS. As far as manned aircraft are concerned, I do not know of any; no, sir.

Mr. DOLLIVER. Are there such devices for a nonmanned aircraft?

Mr. FURNAS. There is in this sense, sir, that the devices on the nonmanned aircraft, you can have them so that they will avoid an object or they will seek and have a collision with the object.

In the case of the guided missile, what you are looking for there is for the missile to go and get in contact with the object. It would be perfectly possible in such a controlled system to have it avoid the object. This is one of the cases where the military research and development program is and can have substantial adaptation to peaceful use.

These various control systems are certainly beginning to have some effect on our civilian use, and I think will have far more in the future.

Mr. DOLLIVER. Is that an adaptation that, in your judgment, is likely to come out in the foreseeable future?

Mr. FURNAS. In that case, purely as a guess, I would say that they would not be usable certainly within 5 years, although I might be wrong.

Mr. DOLLIVER. That is all, Mr. Chairman. Thank you, Doctor.

Mr. HARRIS. Mr. Springer?

Mr. SPRINGER. Mr. Furnas, I read from page 1 of Mr. Rothschild's statement:

> The ACC on August 30, 1956, reached agreement on a national program for integrating the very high and ultra-high-frequency electronic civil and military air navigation systems into the common system.

My question is, Is all of what he has said in that statement encompassed in this chart, Summary ANBD Developments, Air Navigation?

Mr. FURNAS. I believe your statement is correct, sir.

In this chart here, this Vortac is the en route control which the pilot receives, so the statement that he made about the Vortac is for that particular part or particular piece of equipment which is involved in this navigation system. I am not quite sure, sir, I understood your question.

Mr. SPRINGER. My point is, it is encompassed within this chart.

Mr. FURNAS. That is correct under Vortac, and my previous discussion of Vortac in there.

Mr. SPRINGER. You are the Chairman of the Air Navigation Development Board, correct?

Mr. FURNAS. Yes, sir.

Mr. SPRINGER. Is this your recommendation for the future contained in this chart?

Mr. FURNAS. I did not submit it as a recommendation. This was purely a report of where we stand and the various developments which may come into use in the future.

Mr. SPRINGER. You are submitting this then only as a program, what is planned; or what are these suggestions?

Mr. FURNAS. I am submitting this as information and really a report on where we stand.

On the lower part of these blocks here, these are the items under development. In the upper part is what we have available presently. In these charts here and these others under development.

I am sure that as the whole aspect of the system goes along there will be many other items that come in for consideration of adoption or requirement.

Mr. SPRINGER. Now, may I put a question again?

Is everything that is below the first line then, on both air navigation and air-traffic control, are they suggested improvements in the present system?

Mr. FURNAS. They are improvements that are either in work or under study.

Mr. SPRINGER. Then not necessarily all that is contained in the so-called second line are recommendations?

Mr. FURNAS. I have not been making any recommendations, sir.

Mr. SPRINGER. Let me ask you this: Are they then suggestions for improvement?

Mr. FURNAS. They are suggestions; yes, sir.

Mr. SPRINGER. In these matters contained in line 2, are all 5 of these requirements, or at least 4 of them, what will that add to the present system which might prevent what happened over Grand Canyon? I am asking for a general statement.

Mr. FURNAS. Yes; that would add to the system that both aircraft in that case would have known where they were quite precisely at that time relative to a station, and they would also have known where they were in relation to each other. In other words, they would have known at least that there was another aircraft in the close vicinity. The ground would have known where they were and would have known that they were very close together and given them more precise warning.

Mr. SPRINGER. There is nothing herein contained that will allow the aircraft themselves to automatically know the vicinity of the other aircraft?

Mr. FURNAS. There is in the so-called safety beacon, which in the text I mentioned was one of the things, an adaptation of that will let the aircraft know that there is another aircraft in his vicinity.

Mr. SPRINGER. By radar safety beacon; am I correct in that?

Mr. FURNAS. Yes.

Mr. SPRINGER. Could you tell me briefly how that will work?

Mr. FURNAS. The radar safety beacon itself for the present use that is planned for it will send back an increased or amplified pulse to the ground station so that you will get a better signal of where the aircraft is. The additional mode or aspect which is being planned on that would be that this set would be turned on and out to a certain distance, this same set, if there were an aircraft at the same altitude approximately, and would receive a signal from it which simply could be a sound or it could be a light that would say to the pilot, "There is another aircraft in your vicinity at your altitude."

Mr. SPRINGER. This would be recorded in each one of the airplanes?

Mr. FURNAS. This would be in each of the airplanes.

Mr. SPRINGER. Is this something similar—I am a Navy man—to your underwater sonic ranging?

Mr. FURNAS. Yes; you can say that underwater sonic ranging is underwater radar and this is airborne radar.

Mr. DOLLIVER. We had some testimony yesterday, Doctor, from a witness who referred to the APN–69 and APN–59, one of which is a radar beacon and the other a radar receiver carried on planes. Is that what we are talking about now?

Mr. FURNAS. I was puzzled about the designations you have. I am not sure what he was talking about on that.

Mr. DOLLIVER. This witness was talking about what he called a cooperative system of radar which, he said, was already in military aircraft and being used. He claimed he had seen them and been in the same cockpit with them. One was a radar beacon which would send out a signal. The other was a radar receiver which would be in the cockpit and would apprise the pilot of any approaching aircraft in which the beacon was being used.

The witness said that this was being developed by the Weapons Guidance Laboratory at Wright Development Center at Dayton.

Mr. FURNAS. Well, I think I know now, sir, which one you are referring to. That is one in the early experimental stages. It is not the system of the safety beacon we are speaking of here. This, of course, might be a system that might be useful when properly developed for civilian use. I would think it is simply not far enough along yet to give us any information on that.

Mr. DOLLIVER. Thank you.

Mr. SPRINGER. Now, Dr. Furnas, coming to the second item, you say that the improvement would take place by virtue of knowledge by the airplane from the ground that another airplane is in the immediate vicinity.

Mr. FURNAS. That would be very helpful.

Mr. SPRINGER. Would you explain how that worked?

Mr. FURNAS. If the ground has full information about where the aircraft are and there are two which are getting dangerously close together, then the ground control could at least inform both aircraft that there is someone close in your vicinity.

Mr. SPRINGER. May I ask this question?

Is that contained in the second line of this legend, chart, under air-traffic-control requirements Nos. 3 and 4?

Mr. FURNAS. This is where the surveillance radar, this is in the airport surveillance radar which we have a few now and, of course, the program includes a great many more in the vicinity of an airport. We now have the airport surveillance radar and that is the type of equipment which will give the controller that type of information.

Of course, in order to make this complete en route, we need to have radar coverage, more complete radar coverage, out beyond the immediate vicinity of the airport.

Mr. SPRINGER. Is that contained, then, under radar safety beacon?

Mr. FURNAS. The radar safety beacon will add to that because the radar safety beacon essentially extends the effective range of radar so that they can detect the aircraft as to where they are. Then the ground controller over substantial distances will be informed and he will know that two aircraft are dangerously close together.

Mr. SPRINGER. All right.

Now, is it anticipated that this beacon has what range?

Mr. FURNAS. About 200 miles.

Mr. SPRINGER. This means, then, that you would have these radar safety beacons at approximately those distances all over the country?

Mr. FURNAS. When we get the complete network; yes, sir.

Mr. SPRINGER. Is there anything else that would be used or suggested on this chart or in your statement that would increase the knowledge of the airplane pilot or the ground station that there were two airplanes in the immediate vicinity of each other?

Mr. FURNAS. I think the only one suggested on this chart are the safety beacon and the surveillance radar.

Mr. SPRINGER. I am trying to get this before the committee in simplied form, you would have in effect radar, so-called echo ranging, between planes and you would have also the ground radar safety beacon which would notify ground, and they in turn could notify the plane.

Mr. FURNAS. That is correct.

Mr. SPRINGER. That is the two improvements that are suggested.

Mr. FURNAS. That is correct.

Mr. SPRINGER. Is there anything else?

Mr. FURNAS. Contributing to that is the so-called data link in which the airplane will automatically send back to the ground the information of where he is from the surveillance radar. In other words, it will call attention to the general statement in here on the collision problem that there are other developments underway which we are following with a great deal of interest.

It is very difficult at this present time to see how we are going to solve this problem satisfactorily, but we are not ignoring the possibility of some other developments coming along that may offer a satisfactory solution.

Mr. SPRINGER. Now, these are the two suggestions that you are willing to make on September 13, today?

Mr. FURNAS. That is correct.

Mr. SPRINGER. Mr. Chairman, that is all.

Mr. HARRIS. Doctor, you are here as Chairman of the Air Navigation Development Board and have given a report of the Board's activities?

Mr. FURNAS. Yes, sir.

Mr. HARRIS. You are also here in the capacity of Assistant Secretary of Defense.

I want to refer to the letter of the Air Navigation Development Board dated March 31, 1956, revised I beileve July 20 or maybe released that date. That was when Dr. Quarles, I suppose, was Chairman.

On the last page of the letter there is this statement:

> The Board now finds that the unknown factors have been satisfactorily resolved and can now state that TACAN is technically suitable as a common system component.

Do you subscribe to that?

Mr. FURNAS. That is correct.

Mr. HARRIS. Then immediately following that, you have presented with it, dated July 20, 1956, a plan of action involving transition and final use of a common navigation system. Then you go ahead and outline this plan of action. That is, I consider a recommendation to the Air Coordinating Committee.

Mr. FURNAS. That is correct, sir.

Mr. HARRIS. The Air Coordinating Committee then, as of August 30, announced the agreement and acceptance of this VORTAC as a system?

Mr. FURNAS. Yes, sir.

Mr. HARRIS. In this particular field?

Mr. FURNAS. That is correct.

Mr. HARRIS. Now the question that I wanted to get answered by you, representing the military as Assistant Secretary of Defense, was:

Does the military agree with this as a system that should be used?

Mr. FURNAS. Yes, sir.

Mr. HARRIS. Do you know of any differences of opinion by any of the departments in our military with reference to the use and utilization of VORTAC as a system of air navigation aids?

Mr. FURNAS. Might I say that I would not be surprised if there were some differences of opinion, but I do not know of any.

Mr. HARRIS. So far as you know, it is acceptable by each of the departments throughout the military?

Mr. FURNAS. As far as I know; yes, sir.

Mr. HARRIS. Thank you very much.

Let me again express in behalf of the committee our appreciation for your appearance here this morning. The information you have given us, the plan of action you have outlined, which means so much for the future, is very interesting. We want to thank you for this and wish you and your associates success in this program.

Mr. FURNAS. Thank you very much, Mr. Harris.

Mr. HARRIS. I am advised that Colonel Frizen, Col. John E. Frizen, Chief of the Navigational Aids Branch of the Air Force, is here.

Colonel FRIZEN. Yes, sir.

Mr. HARRIS. I have a note here that you do not have a prepared statement but you are here to answer questions.

Colonel FRIZEN. Yes, sir.

Mr. HARRIS. Do you have any further comment that you wish to make?

Colonel FRIZEN. No, sir. I think the problem has been very well explored by Mr. Rothschild and Dr. Furnas, and certainly, speaking for the Air Force, we are heartily in accord with the decision of the Air Coordinating Committee.

Mr. HARRIS. You think this device will work?

Colonel FRIZEN. There is no question in my mind, sir.

Mr. HARRIS. I am glad to get that information, too.

I was advised by Dr. Quarles in a letter that Gen. Alvin L. Puchenski is here?

Colonel FRIZEN. No, sir; I am taking his place.

Mr. HARRIS. I wanted to know, since I had the letter from Dr. Quarles.

I observe that with Secretary Rothschild this morning is Mr. L. W. Burton, special assistant to the Administrator of Civil Aeronautics and alternate member of the Air Coordinating Committee. I thought the record should show that he was present.

Also, that Capt. Robert L. Eldridge, Head, Air Navigations Aids Branch, United States Navy, Office, Chief of Naval Operations; and vice chairman (presiding), Air Traffic Control and Navigation Panel, is here.

Captain ELDRIDGE. Yes, sir.

Mr. HARRIS. Captain, since we are making a record on this and so we will all know, are you in a position to state or to indicate that the Navy is in accord with this?

Captain ELDRIDGE. The Navy has wholeheartedly endorsed the action of the ACC in this matter.

Mr. HARRIS. Thank you very much.

We also have with us Mr. John M. Beardslee, Assistant Administrator for Operations and CAA member of the Air Traffic Control and Navigation Panel.

We also have Mr. Silas F. Clark, Acting Chief of Systems Engineering Division and chairman of the working group to study the VORTAC plan, SWG 19.

Then we have Mr. J. B. Watson, airways operations specialist, Planning Division, and special airways consultant to the Air Traffic Control and Navigation Panel.

Have I left anyone out?

Mr. Secretary, do you have any others you want noted in the record?

Mr. ROTHSCHILD. I think it might be well to note that Mr. William Neumeyer, Director, Air Coordinating Committee, is here, and Mr. Robert Froman of the Civil Aeronautics Board is present, too.

Mr. FURNAS. Might I suggest that Mr. Ernest C. Wood, who is the full-time representative of the Department of Defense on ANDB, and Mr. D. K. Martin, Acting Director of ANDB, and Mr. J. E. Sommers, full-time representative of the Department of Commerce on ANDB, are all present.

Mr. HARRIS. I personally am greatly encouraged over what has been accomplished in the last few weeks.

I believe the members of the committee feel as I do but I recognize the difficulty in getting all of these groups together and have them come up together with a unanimous program such as this.

In this way I think the program can be expedited, and I think the funds to carry it out can be obtained much easier.

We have this afternoon General Arnold, vice president of operations of the Air Transport Association.

General, I believe you have been here this morning?

Mr. ARNOLD. Yes, sir, Mr. Chairman.

Mr. HARRIS. Will you be prepared this afternoon?

Mr. ARNOLD. Yes, sir, Mr. Chairman.

Mr. HARRIS. The committee will adjourn until 2 o'clock.

(Whereupon, at 12:35 p. m., the subcommittee recessed, to reconvene at 2 p. m. of the same day.)

AFTERNOON SESSION

(The subcommittee reconvened at 2:15 p. m., Hon. Oren Harris (chairman of the subcommittee) presiding.)

Mr. HARRIS. The subcommittee will come to order.

General Arnold, we have scheduled you for this afternoon. You are vice president in charge of operations of the Air Transport Association. I observed this morning that your president was here. I don't see him here this afternoon. Perhaps he is leaving it all to you.

STATEMENT OF MILTON W. ARNOLD, VICE PRESIDENT OF OPERATIONS AND ENGINEERING, AIR TRANSPORT ASSOCIATION

Mr. ARNOLD. Thank you, Mr. Chairman. He regretted that he was unable to attend this afternoon. Because of previous schedules, we had some idea that possibly we might be on this morning. Unfortunately, he could not be with us this afternoon. He asked me to express his regrets.

Mr. HARRIS. I am sorry that we could not get to you this morning. Being here, of course, you observed the program and understand that it was rather full.

We are glad to have you this afternoon to pretty well conclude for the time being the hearings on these various problems in connection with aviation.

As I recall, you were scheduled to appear before the committee just prior to the adjournment of Congress, but because of the situation at that time, we had to postpone those hearings until now. Perhaps that has given you a little more time to revise some of the things you were going to say in the light of developments since then.

We are glad to have you and will be glad to have your presentation at this time.

Mr. ARNOLD. Thank you, Mr. Chairman. It is, indeed, a pleasure to appear before you and the committee.

In some of the problems that we stated this morning we did take advantage of the revision, but it was a little short to revise some of the things over the noon hour. So if you don't mind, possibly we can elaborate on a few points, if the chairman and the committee desire, after the prepared statement.

Mr. HARRIS. Yes. You may proceed.

Mr. ARNOLD. Gentlemen, my name is Milton W. Arnold. I am vice president of operations and engineering for the Air Transport Association.

Our association, as you know, is comprised of practically all of the certificated United States air carriers. I am here at your invitation to discuss air safety, particularly with regard to air traffic control. I assume you would expect me to comment on the Grand Canyon accident and that you also want to hear our views as to how the possibility of such an accident in the future can be minimized.

In order to discuss these matters intelligently, we should understand several basic principles of air traffic control. First, there are only two ways in use today of preventing collision. One is for the pilot to see the other aircraft and avoid it. This is the visual-flight-rule method known as VFR or "see and be seen."

The other way is the instrument flight rule or IFR way. Under instrument flight rules, the air traffic controller issues a clearance to the pilot. The clearance contains instructions as to the route and altitude to be flown, calculated to provide the flight with adequate separation from other IFR flights. Note that the IFR system only provides separation between IFR flights. It does not separate an IFR flight from VFR flights.

The choice as to whether a flight is to be operated IFR or VFR rests with the pilot provided the weather is such that certain minimum distances from clouds and specified visibility can be maintained. If these weather minimums cannot be met, the flight must be operated IFR. If they can be met, the pilot may elect to fly either IFR or VFR.

It should also be understood that the IFR system is responsible for providing separation only while flights are operating within controlled airspace. Flights which do not operate within the confines of the Federal airways are not required to make their presence known to the air traffic controllers. Therefore, the traffic controller cannot

be responsible for providing separation in such areas. So much for the principles of traffic control.

With reference to the Grand Canyon accident, while all the facts won't be established until the Civil Aeronautics Board investigation is completed and their findings announced, certain information is available which deserves comment.

It seems reasonably well established that there was a midair collision. Since the nearest controlled airspace is about 90 miles from the wreckage, it seems reasonable to assume that the collision—if one occurred—did not take place in controlled airspace.

A strong request for the designation of an airway along that route, specifically from Daggett, Calif., to Pueblo, Colo., was made over 2 years ago. The CAA, because of lack of adequate funds, facilities, and personnel, has not yet found it possible to fulfill that request.

There has been some question as to why the TWA flight was cleared to cruise "1,000 feet on top" when this permitted the 2 aircraft to fly in close proximity to each other at the same altitude. The clearance to cruise 1,000 feet on top is 1 of 2 types of IFR clearances wherein the pilot is required to maintain his own separation by visual means.

The other is the clearance to climb or descend VFR. In reality, both of these types of clearances are instructions to the pilot to fly VFR until full IFR protection is reinstated. Insofar as separation from other aircraft is concerned, 1,000 feet on top is the same as if the pilot had canceled his IFR flight plan and proceeded VFR.

It is our belief that the use by ATC of 1,000 feet on top, as well as VFR climbs and descents, should be minimized. On the other hand, to eliminate this type of clearance and still permit VFR flight would accomplish little.

What is the answer, then? Insofar as the Grand Canyon accident is concerned, we must await the outcome of the Civil Aeronautics Board investigation.

We have, however, been working on the overall air traffic control problem for some time. Three years ago the airlines established a committee to concentrate specifically on the air collision problem. One of the first actions of this committee was the decision that the only real answer to the collision problem was positive control.

This has been defined as control which assures separation in accordance with accepted separation standards between all aircraft in a designated area, regardless of the weather and without recourse to visual-separation procedures. The airlines committee set this as the goal, realizing that it would require a considerable improvement and expansion of the present air-traffic-control system before that system would be adequate to cope with today's VFR as well as IFR traffic.

This decision recognized the fact that the airlines and their pilots believed that the see-and-be-seen principle is no longer valid as the basis for building a traffic-control system. Military experience with jets confirms this view. In coming to this decision, the airlines recognized fully that the rights of private flying as well as other users of the airspace would have to be properly respected.

It is our firm conviction that positive control can be applied in such a manner as to provide the needed protection for airline business and military flying without imposing an undue hardship on private flying. By undue hardship we mean that we would expect the system to per-

mit the steady expansion of private flying on a safe and stable basis.

It was this same airline committee which started a program aimed at the development of a proximity warning or anticollision device for aircraft. Although the development of such a device is a real challenge to the electronics industry, the program has been moving along rapidly and it is now expected that an initial equipment will be available for testing in a year to a year and a half.

Recognizing the inevitable delay involved in such matters as positive control and proximity devices, the airline committee also has been working on interim measures. These include suggestions for improved communications, a study of increased VFR weather minimums, expanded use of radar for VFR as well as IFR flights, and even reminders as to the need for clean windshields.

In addition to this particular committee, other groups of airline people are working on such matters as improved altimetry—aimed at better vertical separation of aircraft—and improved external lighting of aircraft. The efforts of airline management, working with pilots and manufacturers of lights have been quite successful.

We have also poured considerable effort into special working group 13 of the ACC air traffic control and navigation panel. We did so because we believed that SWG–13 would be effective in speeding the improvement of ATC.

We were instrumental in the development of the Washington high-density trial plan, which was aimed at finding the best practical solutions to high-density terminal traffic problems.

In our efforts to develop recommendations for the improvement of air-traffic control, it soon became evident that there was a serious lack of accurate information regarding the delays caused by inadequate air-traffic control service. We needed to know the length of the delays, where they were occurring, and what caused them, in order to suggest improvements.

The Air Transport Association, therefore, drew up a plan for the collection of this information. With the cooperation of the CAA we are now collecting complete data on every 40th airline flight and by this sampling technique we are compiling the necessary data. The results of this program will be known by the end of this year.

However, even with the information at hand, we were confident that the job to be done was a big one. When the CAA's 5-year plan was first announced, it was our immediate reaction that, although the plan was a step in the right direction, it was too small a step. We urged that the $18 million first proposed for the initial year of the plan be raised to the limit of CAA's ability to administer the funds.

The CAA reported its ability to handle $55 million, and we continued to support this figure in spite of the $40 million limit that was eventually placed upon it. One of the chief reasons that we continued to support the higher figure was because we believed that such a budget would materially speed the day when CAA would be able to control VFR as well as IFR traffic.

The airlines program for improvement of air traffic control: We have stated previously the strong feeling of the airlines that a system of complete air traffic control must be developed to provide separation and organization of all traffic, regardless of weather conditions, except in certain specific areas, principally at low altitudes, where

the nature and density of traffic does not require such stringent handling.

Achievement of this objective will be a major undertaking, and will require considerable time and effort. It will not come with groans and squeals from those who feel that they are being deprived of so-called freedom of the skies. Government leaders who are concerned with the overall benefits to the public in the form of safety and efficiency in the use of airspace will require courage and foresight in coping with such cries, and they will recognize that the new concept of positive traffic control, of which we speak, is not a selfish desire for the benefit of airlines alone, but is equally sought after by military aviation and business aircraft in the interest of safety and efficiency.

Yet it takes into consideration the needs of the smaller aircraft who neither require nor desire positive air-traffic control at all times.

Failure to move ahead on such a bold concept can mean only one thing: The air-traffic-control system will remain much the same as it is today, and while some limited increases in traffic capacity will result, maximum satisfaction of the requirements of all users of the airspace will never be achieved.

Special Working Group 13 of the ACC/NAV Panel has concerned itself with this matter in considerable detail, and we are proud to have been an active participant. The final report of this working group is not yet available, but represents some 2½ years of work by persons actively involved in all phases of military and civil aviation. Your committee might find the work of SWG 13, even at this stage, to be of considerable interest in the problems at hand.

Positive control of air traffic must, for the moment, be regarded as a desired goal, for the existing air-traffic-control system is not prepared to accept the traffic loads that would result without imposing exceedingly high rates of delay and cancellations on all aircraft operators.

It is, therefore, imperative that action be initiated at once to put into effect certain improvements in a progressive program which will lead as rapidly as possible to the ultimate goal. This is to say that solution to all air-traffic-control problems cannot be found overnight in a single ultimate system, but will require a constant state of improvement.

The first step which can be taken is the extension of controlled airspace to embrace additional routes on which no traffic-control service is rendered. Control on many of these routes has been requested over the past several years, but has been denied by CAA primarily because of their inability to accommodate the added workload.

One of these was the Pueblo-Daggett route on which the TWA/UAL accident occurred. As stated earlier, control of this route was requested over 2 years ago.

The Federal airways system has grown steadily since the late 1930's. But the growth has failed to keep pace with the expansion of flight operations. The Civil Aeronautics Board has authorized scheduled airline service in many new cities. But airways connecting these cities have not been provided.

In lieu thereof, CAA has adopted a practice of establishing approved routes over which airlines are authorized to operate, and which are

included in Air Carrier Operations Specifications approved by the CAA.

It is noteworthy that the CAA Aviation Safety Manual governing this activity states in part, "* * * In this connection, every effort should be made to have the proposed route designated as a civil airway." Unfortunately, such efforts have not been entirely fruitful.

The Federal airways system has failed in another very important respect. There have been no airways established specifically for high-altitude, long-range flights. The airway network is laid out from city to city—logical enough for short- and medium-distance flights—but antiquated as a cowpath for Super Constellations and DC–7's flying coast to coast. And jet transports are just around the corner.

These deficiencies can be remedied, in many cases, by the immediate employment and training of additional air-traffic-control personnel. It is important, however, to recognize that air-traffic controllers are specialists, needful of considerable training and experience in order to cope adequately with this complicated job.

During the past several years, the expansion of aviation has far outdistanced the CAA's ability, under existing appropriations, to maintain and provide an adequate level of experienced personnel to absorb the increasing duties. This should be rectified by immediate authorization for the employment of additional air-traffic controllers in anticipation of expanding activities to permit proper training prior to their assignment to responsible positions.

It would be improper to drop the discussion of air-traffic-control personnel at this point, for even with immediate authorization to employ new personnel, there remains one more hurdle. For years air-traffic-control facilities have reported a shortage of personnel, particularly at busy traffic locations.

Despite these vacancies, which might be filled through transfer or promotion of persons, there is a natural and logical reluctance for controllers to transfer into busier locations, even though a promotion might be involved. The reason is straightforward.

There is no added compensation for a controller who accepts such a position. He could well remain at a less busy facility and receive the same salary. Why, then, should he move when all he can look forward to is the possibility of becoming embroiled in high-density traffic with its attendant added responsibility and nerve-racking pressures?

The air-traffic controller is not a high-salaried person, despite the high degree of skill and responsibility attached to his position. Until July of 1949, the chief controller position in any control tower, even such as Chicago Midway, LaGuardia, Los Angeles, or Washington, was paid only slightly over $4,000 annually.

The working controllers receive proportionately less money. The reclassification of these jobs in 1949 gave partial recognition to the true responsibility of air-traffic controllers by upgrading their salaries. But no further recognition of the highly skilled and specialized nature of these positions has been forthcoming.

What few raises there have been come only as part of routine increases to all Federal employees. Today the controller at the busiest air-traffic-control facilities in the Nation—which are the busiest in the world—can expect a base salary of $5,900 a year.

Meanwhile, at other locations, unbelievably as it might sound, there is now a plan approved by the Civil Service Commission which would reduce the base salary of controllers.

Unlike other Federal employment, air-traffic-control specialists cannot comfortably contemplate a long tenure of service. The pressure and strain of the work itself is fact showing its effects in the physical and mental health of controllers who are assigned on a straight 8-hour work shift with no scheduled lunch or rest periods.

If this is our experience in a time when only about 15 percent of all traffic is controlled, what are we to expect if practically all traffic is to be controlled? Air-traffic control is more concerned with the everyday safety of flight than any other function performed by CAA. And let us not forget that the backbone of the entire air-traffic-control system is the air-traffic controller.

Another step which is vital to the solution of the air-traffic-control problem is that of commissioning additional facilities, together with the personnel necessary to operate them, as outlined in CAA's 5-year plan, which is now compressed into a 3-year program. It should be further recognized that even upon completion this plan will not represent the final status of the air-traffic-control program. It is only the initial step.

The CAA's 3-year plan is essentially a list of much-needed equipment. More work is necessary in arriving at new operating procedures upon which the future system will be based. However, the plan embodies a number of vitally important programs. These include:

1. The complete coverage of the United States by an air-traffic-control network of direct communications between pilot and controller to permit an expeditious exchange of data and control instructions without the necessity for relaying such information through "middleman" communications stations.

A corollary to this program is a requirement that all users of the air traffic control system be properly equipped with adequate airborne radio communications to participate appropriately in the traffic control system. Effective communication is the backbone of any traffic control system.

2. Complete coverage of the United States by a network of long-range radar to provide control surveillance of high-density areas and the Federal system of en route airways. This program should be supplemented with airport surveillance radar at a considerable number of additional airports in order to provide effective transition from the en route operation to terminal area arrivals and departures.

3. A complete system of air navigation facilities. The present system of air navigation is a serious deterrent to effective air traffic control. In the first place, the poorly integrated continuance of the low-frequency radio range network, upon which was superimposed the VOR system, has resulted in a confused airway system that challenges the ingenuity of the most able air traffic controller.

Aircraft operating on these intermixed networks preclude proper coordination of traffic into effective channels and require undue attention by the controllers for the integration of these operations. Action should be initiated immediately to remove the antiquated system of low-frequency ranges.

Fortunately, the executive branch of the United States Government has resolved the VOR/DME/TACAN problem. The present program appears to be a sound solution and compromise which will insure maximum utilization of equipment, and a minimum of duplication of facilities. It should also allow steady improvement and expansion of traffic control procedures and services.

4. Increased numbers of instrument approach aids, both electronic and visual, are planned. Nevertheless, instrument landing systems and high-intensity approach lights should be installed to implement a second instrument approach in a different direction at all highly active airports in order that the airport acceptance rate might be maintained at optimum even though the approach direction is different from that now provided by the single ILS and approach-light installations.

Visual aids, such as high-intensity approach and runway lights, are an imperative adjunct to all approach systems in order to insure positive transition to final landing without interruption of the traffic flow.

Last year we recommended to CAA and to the Senate Appropriations Committee the inclusion of additional funds totaling less than $1 million, which would greatly enhance safety and airport utilization to a great number of users.

Our program envisioned the installation of condenser discharge reference lights at approximately 300 small airports which today have no lights of any type for approach guidance, but are only equipped with runway lights. This could be accomplished with minimum cost and effort and requires but one light at each end of the longest runway of the airport. This request was denied by Congress.

We wish to point out once again that the matters itemized above all lend themselves to early solution and, when accomplished, will make the present system of air traffic control much more effective than it is today in relieving the critical situation with which we are presently faced. But this progress, in itself, is not sufficient.

New system of air-traffic control: Let us now take a brief look at a completely different and modern system for handling tomorrow's aviation needs—a comprehensive, thoroughly integrated master plan designed to accommodate all types of aircraft. The economy and defense of the country require such a plan and require it immediately.

In addition to the improvements which will result from the accelerated CAA 3-year plan, the new system should first provide for complete and constant control of all traffic at the higher, more critical altitudes, where our faster aircraft must operate, as well as in all high-density traffic areas.

As rapidly as possible, there should be a lowering of these control altitudes in order to encompass all airspace under all weather conditions, except in those areas where the amount or type of traffic does not warrant it. In other words, our goal should be positive control, under all weather conditions, for all types of aircraft, wherever conditions require.

We believe there is sufficient airspace to accommodate a full flow of traffic to the available airports, provided the system uses the airspace efficiently with modern techniques and on a broad enough scale.

Such a system is not designed overnight. The basic design principles are known, and the techniques are available, but it is conservative

to state that a minimum of 2 years' research and planning is needed to develop the required system and the specific equipment.

In designing the system of the future, the problem is to apply proven techniques of automatic transmission and computing to the safe separation and control of aircraft, with the least possible restriction to their movements; that is, a semiautomatic, or even an automatic, full-time air-traffic control operation. The system requirements include:

(*a*) A new method of semiautomatic visual communications link between pilot and controller to reduce voice communications and the resulting workload on the controller.

(*b*) A new method of supplying to the controller the information he needs for preparing clearance information for the pilot. We visualize an electronic reservoir of data such as aircraft position, altitude, speed, direction, and identity for every flight—all of which is capable of being displayed automatically to the controller.

Because air-traffic control lacks these modern devices, we now have an excessive assignment of airspace to each flight, and as a consequence, inefficient use of the airspace and unreasonable restrictions on flight operations. If proper equipments were employed, we could decrease the required airspace allocation per aircraft, yet maintain the same level of safety.

For communications, we are still relying heavily on voice telephone and voice radio, which is like a party-line system, where one must listen to all calls to be sure he will recognize those intended for him. We haven't even added the hand-cranked Bell telephone of 1900, let alone either a local or long-distance dial system to our voice radio.

There is also a need to relieve the pilot of the necessity for making more and more frequent voice reports to the control agency. For years, automatic weather reports have been transmitted from ascending balloons, rocket and missile air-to-ground automatic communications systems have reached a high state of development; yet, pilots must still report positions from the jet aircraft just as they have for so many years from the DC–3.

Under present control methods, pertinent facts on each flight—position, altitude, speed, direction, et cetera—after being relayed by voice to the controller, must be handwritten on strips of paper. This information is then scanned repeatedly by the controller in order to establish a proper flow of aircraft while providing them with safe separation, one from another.

In other words, he operates from a mental image of the airspace under his jurisdiction, his only tools being the notations on the many strips of paper in front of him.

The manual process of passing control jurisdiction from one controller to another is also slow and cumbersome. This, too, could be speeded and simplified by automatic transmission.

The mental strain on each controller is intense, and the men are to be commended on the effort which they are putting into an increasingly difficult job, and the excellent safety record they have achieved.

If known techniques and instrumentation are applied, it is possible to reduce the space requirements per aircraft, relieve the manual burden on the controllers through automatic handling of data, facilitate the transfer of control jurisdiction, and at the same time handle more traffic with the same complement of control personnel. What's more,

we can have the advantages of the service on a 24-hours-a-day, all-weather basis.

To do this, we need dynamic leadership and, of course, that leadership needs to be properly supported with adequate budget allowances.

The techniques are known, and many of the automatic and semi-automatic devices in use today are directly applicable to the problem of helping the air traffic controller. One class of business machine, based upon magnetic inventory and electronic control, is produced in 38 models by 24 manufacturers; the 2,800 such machines in use are valued at $227 million; 1,700 additional are on order valued at $186 million. Other types of business machines using applicable techniques in somewhat similar tasks are also extensively used.

An adequately financed and properly directed program, within a few years, could give us the improved pilot-controller communications and the electronic inventory and display of data needed for the automatic system we envision to handle, with continuing safety, the increasing air traffic of the future.

We have devoted considerable material here to the problems of the present air traffic control system, and to various equipments and concepts for a possible remedy in a new air traffic control system. It is most important, however, that we all recognize that the most essential part of any system—whether it be in its planning, its implementation or its operation—is human beings; competent, well trained, dedicated people like the air traffic controller.

Money alone can buy the needed equipment, but it will take a wise personnel program with proper pay scales that recognize the skills and responsibilities involved in order to maintain and operate a safe and greatly expanded system of efficient and flexible air traffic control.

Let us not forget that the problems of our national defense, as well as those of the flying public, both private and commercial, have established a demand on the air traffic control service and facilities far beyond that ever envisioned by the most daring forecaster.

Yet we still have the best and safest system of air-traffic control of any in this world. Dedicated controllers have made it such, and will continue to do so, unless, in our desperate search for a new system, we forget the people who must operate it.

On behalf of the Air Transport Association and its member airlines, we greatly appreciate the opportunity to appear before you and express our views, Mr. Chairman, and gentlemen of the committee.

Mr. HARRIS. Thank you very much, Mr. Arnold, for this very informative and dynamic statement which you have presented to us.

Questions, Mr. Williams?

Mr. WILLIAMS. I believe not.

Mr. HARRIS. Mr. Dolliver?

Mr. DOLLIVER. I note you say on page 3 that the pilots, as well as the airlines, think the see-and-be-seen principle is not valid any more. Do you speak for the pilots as well as the airlines, or on what do you base the statement that the pilots believe that?

Mr. ARNOLD. Mr. Dolliver, the statement is based upon a survey that the Air Transport Association, with the cooperation of the airline pilots, developed over a period of approximately 6 months.

Of course, the data were dependent upon the cooperation of the pilots and the reports they filed. No, sir; I do not speak officially for the pilots association.

Mr. DOLLIVER. I didn't think you did, but I noted that and you have now explained the basis of it.

Is some official statement or data available to the committee, do you know?

Mr. ARNOLD. Mr. Dolliver, the essence of it was covered in the report we refer to rather generally as the Harding committee report—I believe it was the aviation facilities committee—which was publicized. I don't have a copy with me.

The essence of the report was to further determine the validity of the see-and-be-seen method, as to whether it was in their estimation valid. They had access, of course, to military records as well as commercial records and our records.

The unequivocal statement of that committee—and there was no dissent—was the factual statement that I have made here, that the see-and-be-seen method of separation is not valid.

Mr. DOLLIVER. Can you give us any ideas as to how comprehensive or exhaustive the survey of the pilots' opinion was?

Mr. ARNOLD. Captain Jensen is here. I am trying to remember the number of reports. If I may ask him—Captain Jensen, do you remember the number of reports we received?

This is Capt. Walter Jensen, who is an airline pilot on loan from American Airlines.

Mr. Dolliver, Captain Jensen states that the determination was based on over 800 reports received from airline pilots of our members over a period of approximately 1 year.

Mr. DOLLIVER. On page 4 you refer to the fact that the Air Transport Association was instrumental in developing the trial plan here at Washington's high-density airport.

Mr. ARNOLD. Yes, sir.

Mr. DOLLIVER. Would you go into that a little further and explain what you did and what transpired with respect to that development at the National Airport?

Mr. ARNOLD. Mr. Dolliver, the original idea and concept was based—let me go back here—on the records of the Civil Aeronautics Board that the greatest exposure rate from fatal accidents, collisions, occurred in what we call slow closure rates, namely, not people banging into each other, to put it crudely, straight ahead, but on difference of speed of 20 to 30 miles an hour and in such areas.

I don't know whether your committee has discussed that with the Civil Aeronautics Board, but those reports are rather comprehensive since 1948.

As a result of that, the question of controlling airspeed in high-density areas became a problem. There were those in aviation who believed that the determination of such a program which envisioned the following: the principals were controlled speed of approximately 180 miles an hour within such an area. The area was defined.

Secondly, it was anticipated that to enter this area, regardless of the weather, when you crossed the boundary you would have to report your position by radio.

Mr. DOLLIVER. To whom?

Mr. ARNOLD. To the traffic controller, sir, or if it happened to be a military designation, it would have to be a military tower. This was the concept which was originally put in in Washington.

A hearing under the Civil Aeronautics Administrative Procedure Act was held under the General Counsel's Office of the CAA in which commercial and military users of the airspace participated. There it was discussed in an open hearing as a proposed piece of rulemaking, since (1) the CAA had jurisdiction of the airspace; (2) Washington was in a unique position in the fact that they controlled the airport.

As a result of those hearings, a trial designation of a high-density area was published in the Federal Register and as such, certain requirements were promulgated in that area, such as speed control, but the trial was initially eliminated on the requirement of radio contact.

That has been under investigation as a guinea pig, so to speak, for approximately 6 or 8 months, I believe. It is an attempt to evaluate the contribution of such a program, whether it will enhance safety of operations.

Mr. DOLLIVER. I understand that the two principal features of this high-density trial plan here were the elimination of approach speed to 180 miles, approximately, and the intercommunications.

Mr. ARNOLD. Yes, sir.

Mr. DOLLIVER. Is it possible with modern high-speed planes which exceed 300 or 400 miles an hour to reduce their speed to that limitation of 180 miles on approach?

Mr. ARNOLD. The military can give that better; there are some exceptions, I am sure, in some of their high-speed restricted experimental models, supersonic aircraft, by generally speaking, the best known types of tactical aircraft today, both jet and piston, can conform generally to this rule of 180 miles an hour in a traffic pattern.

Mr. DOLLIVER. Has any final evaluation been made of those trials here? Have there been any conclusions or are you prepared to make any conclusions from the trial?

Mr. ARNOLD. Unfortunately not. If I told you, "If you fly into this thunderstorm, you will get killed," and you didn't fly into it, you wouldn't know whether you would or not; would you?

It is a problem of a sampling process which needs duplication and extension and more time. Unfortunately, you cannot compare the Washington high-density center to one that didn't have it, because the conditions are different. It is a very difficult thing to evaluate.

Mr. DOLLIVER. Are you personally ready to render any opinion about it?

Mr. ARNOLD. I don't think we are, and I don't believe the airlines are, because of the insufficient experimentation and development on it. I think you will find differences of opinion, Mr. Dolliver.

Mr. DOLLIVER. Do you anticipate that before the trial is concluded any opinion will be rendered or not?

Mr. ARNOLD. We certainly hope so, but I personally am confident it is going to be very difficult to add this thing up and come out as to whether it is black or white; very difficult.

Mr. DOLLIVER. I note in your statement that the Air Transport Association is plugging for a complete air traffic control at all times, regardless of weather, with the exception of very low altitudes. That is a pretty comprehensive program; is it not?

Mr. ARNOLD. It is based on one assumption, if you believe it; namely, that you cannot mix VFR traffic and IFR traffic and that the see-and-be-seen method is not a proper method of separation of aircraft.

Mr. DOLLIVER. Is that see-and-be-seen method at all hampered by the configuration of the modern plane?

Mr. ARNOLD. I think we go back to a basic problem here. There are many authorities on the problem. Speaking specifically of high altitudes, our medical profession and flight surgeons tell us that, regardless of the difficulty of seeing an object, the vision is materially affected at high altitude because of certain conditions in the atmosphere and also because of the lack of depth perception.

To say that we are sitting in a greenhouse in the cockpit, of course, is fundamentally and basically a misstatement. I believe anything can be improved. It is a problem of accommodation of the cockpit with proper design of the aircraft.

There are a number of committees, such as the Society of Automotive Engineers, the aviation division of that, the military, the airline pilots, and the airlines, working on cockpit instrumentation and standards for minimum observation from the cockpit.

My only point, and the best way I can explain it, Mr. Dolliver, is that if I tell you there is something in the back of this room, you have a mental image immediately to know how far the end of that room is. You know where to look. Your mind automatically takes it.

If I tell you there is an airplane out here, I tell you in the first place it is in an area. Then you must go through the process of focusing your eyes from zero to infinity and back and forth and search the whole area. It is just the human inability of seeing.

Mr. DOLLIVER. I have had that experience when flying, seeing a plane in the distance and calling someone else's attention to it and they can't see it until after some focusing. I can understand that that would be a problem.

The thing I had in mind was that in the cockpit of many planes there are quite a few blind spots. That is, they can't look straight down, and they can't look straight up, in a good many of them at least. It is certainly possible that a collision such as that which took place over Grand Canyon might have been averted had there been visibility up or down.

Is there any thought in your organization that some better visibility arrangements might be installed which would, perhaps, give a new lease on life to the visual flight arrangements.

Mr. ARNOLD. Yes, sir; there are. As we mentioned, clean the windshields better. That is the sort of thing we can do immediately. There are very active groups attempting to improve cockpit visibility and comfort and to improve the peripheral area of vision.

I cannot conceive possibly even if you were capable, how 1 person or even 2 people, pilot and copilot, could possibly coordinate and constantly observe 360°.

Mr. DOLLIVER. In any event, such action would be a palliative, rather than a cure for the thing we are talking about.

Mr. ARNOLD. Yes, sir.

Mr. DOLLIVER. On page 10 of your statement, in paragraph 3, you refer to the poorly integrated continuance of low-frequency radio range network upon which is superimposed the VOR system, and you call attention to the confusion which has been created.

That is a matter largely of electronics; is it not?

Mr. ARNOLD. Sir, I think it is also a matter of the original siting of the ranges. It is also a matter of the fact that we all appreciate

basically that the low-frequency range is susceptible to bends, it is susceptible to ground-wave interference, it is susceptible to complete blackout in static conditions.

Mr. DOLLIVER. It is also true, is it not, that when the ground control, limited as it is, was first inaugurated, the low-frequency range was the one that seemed to be the most stable and available? We didn't know very much about the very high- or ultra-high frequencies.

Mr. ARNOLD. I think that is true in the initial stages. As I recall, the first time I tried to use a VHF communications piece of equipment, I think it was out more than it was in commission, but I think the basic principle has been well established of direct line-of-sight communications, as we term it, and the basic knowledge of it and its simplification and reliability have been well established.

Mr. DOLLIVER. The point I am making is that the development of electronics has far outstripped the practical use of the improvements which have been made in line-of-sight communciations; is that not true?

Mr. ARNOLD. Yes, sir; that is correct, sir.

Mr. DOLLIVER. Certainly it would seem that there is one place where immediate or quite rapid progress might be made, but would it not involve rather a complete overhaul of the communications system with respect to radio ranges and otherwise?

Mr. ARNOLD. No, sir. I think we have had about sufficient time. The Civil Aeronautics Administration, with the approval of the military and the civil users, is engaged in a gradual withdrawal of these low-frequency ranges. This has been going on actively since approximately 1948.

The idea was not to create a hardship on users of the airspace and to allow the military, as well as commercial, to properly equip their aircraft to use the VHF.

Mr. DOLLIVER. Has that process been nearly completed; would you say?

Mr. ARNOLD. We think so, sir, and we think the time must come when, for all practical purposes in this country, within a year or 2 years, some date should be specific for withdrawing them completely.

Mr. DOLLIVER. That is the low-frequency?

Mr. ARNOLD. Yes, sir.

Mr. DOLLIVER. One final item: On page 13 you throw considerable derogation upon the use of voice telephone and voice radio as opposed to automatic transmission of information. Is there not something to be said for voice radio as far as the pilot is concerned? Doesn't hearing a voice, perhaps a familiar one at that, give him a bit of reassurance that a piece of inanimate equipment might not provide?

Mr. ARNOLD. Yes, sir. I am sorry, Mr. Dolliver, if I gave the wrong impression there. My concern was not that we felt that voice communication, as such, would be discarded completely. The idea is that techniques which are known in the employment of voice communications and the transition to automatic data link or telemetering should be immediately accomplished.

For example, today you would not think of putting a telephone in your home to which there were 150 subscribers on the line.

Mr. DOLLIVER. We are getting away from that, I must say.

Mr. ARNOLD. Yes, sir. I have one that has eight people on it, and it is a little difficult. Still, generally speaking, the American public is accustomed to a straight-line voice communication.

In other words, the techniques are known for transmitting voices and calling an individual without interrupting the others.

Mr. DOLLIVER. That brings me to another question. Is it not true that in some instances the message which is being transmitted by the controller ought to be heard by more than the particular plane involved?

Mr. ARNOLD. Mr. Dolliver, you are quite right. There are two schools of thought on this.

Mr. DOLLIVER. That is what I am trying to bring out.

Mr. ARNOLD. Yes, sir. One is called simplex and the other is duplex. Your point of having everybody hear it, I think, is basically sound.

Then you get to the point—and that is why we go to different frequencies—that with all the airplanes flying around Washington, you could not employ one for the control tower, approach control, and the center, at least for the people in the area.

Unfortunately, we have so many people under that step control that a pilot today could not possibly wait in a busy area to get a break. He just has to step on the mike and hope he gets in.

Mr. DOLLIVER. That seems to me to be a rather difficult dilemma that you have in air traffic control in a dense area. I question whether the answer is just direct person-to-person communication.

I fear that that would have the fellow who is not on the right line out in the cold. How could he tell what to do?

Mr. ARNOLD. I think you are right. Let's break it down in two areas. One, in the approach control area, the landing area, yes, we want the maximum number of people on it so the others can hear. On the other hand, en route quite often the man has passed 3 or 4 check points before he can get in to ask that his flight plan be changed.

He may run into some unexpected weather. In that case he would have a straight line into the control, and when the controller was calling ABC aircraft and not XYZ, he wouldn't interfere with the other one.

I didn't expand on that, but those are things that could be done.

Mr. DOLLIVER. Thank you very much. That is all, Mr. Chairman.

Mr. HARRIS. You mean there would be a wavelength or whatever it is, a line direct to that plane and every plane?

Mr. ARNOLD. Mr. Chairman, I personally don't understand it, but it is much like the techniques that you can send several messages over the same wire. I never have quite understood that. You can do it by change of frequency.

We have in operation today techniques—which are called cell call; and there are other such techniques—in general language. This envisions that you are on the same frequency but if you are flying an airplane and Mr. Williams and Mr. Mack are both flying airplanes and I want to call you, I call you on the same frequency, but when I call you a little red light lights up on your instrument panel and you pick up the microphone and answer, and Mr. Williams and Mr. Mack never hear it because I have called your number.

It is the same way on dialing a telephone.

Mr. HARRIS. In other words, it could be done electronically, just as you do it over a telephone wire?

Mr. ARNOLD. Yes, sir. Pan-American has put this system in rather extensively in the Pacific, and American Airlines is testing it on their cargo fleet on several routes. It has been under test for over a year and a half.

Mr. DOLLIVER. There is one other question that I overlooked, Mr. Arnold.

I know from what you say there will be involved a very considerable expense. Has your association given any consideration to the proposition that some of the expense, at least, might be borne by the industry itself rather than by the taxpayers?

Mr. ARNOLD. Yes, sir; very definitely, Mr. Dolliver.

Mr. DOLLIVER. That has been in your thinking?

Mr. ARNOLD. Yes, sir.

Mr. HARRIS. What is the general attitude?

Mr. ARNOLD. Sir, I imagine it is going to be a matter of some discussion on the price.

Mr. HARRIS. I would not be surprised.

Mr. ARNOLD. As was ably put this morning, I thought, by Mr. Rothschild, it is a problem of determining the basis and he mentioned about three methods by which you can determine the use of the airways system. Each way you get a different answer.

Mr. HARRIS. Mr. Mack?

Mr. MACK. General Arnold, at some earlier hearings we had a year or so ago, we asked a few questions about directional antenna in the transmission of position reports. What has been done on that?

Mr. ARNOLD. I am trying to recall, Mr. Mack, the particular problem.

Mr. MACK. It was brought to my mind by the questions put just a few moments ago. At that time we inquired about having directional antennas, especially for the VHF–UHF field, where you could transmit in a certain direction.

For instance, an airplane flying at 5,000 feet would transmit, and the message would not be received by one flying at 6,000 or 7,000 feet. In that way we would eliminate some of the confusion in the air, eliminate the interference with planes which are trying to contact a distant station at a high altitude on the same frequency.

I wondered if you knew of any progress which had been made in experimentation in that field.

Mr. ARNOLD. Very honestly, I have never flown this particular type. I know of what you speak, though. I am not in a position to answer your question directly as to the exact progress of that technique. Unfortunately, Mr. White is not here, but possibly Captain Jensen may know.

May I ask if he knows of any development along that line that is not classified?

STATEMENT OF WALTER JENSEN, AMERICAN AIRLINES, ON SPECIAL ASSIGNMENT TO AIR TRANSPORT ASSOCIATION

Mr. JENSEN. I also know of what you speak, but I haven't heard of any actual testing that is going on. I think the general feeling at the present time is that there is better advantage to speeding up transmissions on a given frequency and data links and that technique, rather than the directional antenna technique. I know of no such tests. However, I heard it mentioned previously also.

Mr. ARNOLD. That was my impression, but I didn't want to give you an incorrect statement. I felt I could say that there were practically no tests being conducted along this line.

Mr. MACK. I had heard of none myself, and that is the reason I inquired about it.

General, do you envision the abandonment of the VFR flight plan in a certain period of years? I arrived a little late, but unless I misunderstood you, you felt that we could have control of all aircraft flying. Is that correct or not?

Mr. ARNOLD. No, sir. The difference, I think, deserves some explanation. In our concept of what would take place on VFR flying, let us suppose, first, we are talking about the CAA's program, 15,000 feet and above, or, if you like a better number, we will say 20,000 feet and above.

In order to achieve the control of all aircraft, you would have the right to file a flight plan in New York and fly to Texas, or from Texas to Seattle, Wash., and go above this lid and fly VFR, but you would be required to notify air-traffic control of the fact that you were going to penetrate this lid.

Then, after you got up there, there would be no reason for you to conform to IFR, but it would be much like today when you go through the identification areas of the military. Although you might be visual, you must position yourself when you cross the boundary and you must give them information on change of your flight plans.

That is what we envision will take place once you get the complete communications and radar coverage above this lid in the domestic limits.

Mr. MACK. You still would not have positive control in that area; is that correct?

Mr. ARNOLD. Yes.

Mr. MACK. By your definition.

Mr. ARNOLD. By positive control we envision that above this airspace, taking 20,000 feet as the layer, you would maybe make all this area into rectangles. The area on the ground would be translated directly below it and you would have key position radars.

You have certain communications. As a pilot you would not know about this block area. We do not visualize that up there you would just have promiscuous flying in every way, that you could fly in this area in 40 different directions.

There would be certain tracks that would go into this area, but you control the area on a block basis, and when you are moving along certain check points which would be a high altitude route, you would be required, either by automatic transmission from your airplane or voice, to give information on your progress.

Mr. MACK. That would apply also to VFR?

Mr. ARNOLD. Yes, sir. Otherwise, you get into this uncontrolled airspace problem, of mixing VFR and IFR. The controller must know of the existence of the airplane. He didn't promise you he wasn't possibly going to separate you from the other airplanes, but he knows everybody who is in that block because they are required by regulation when they penetrate this level to tell him they are going up there and to tell him where they are going.

Mr. MACK. Then they could also set aside blocks or areas up there, for instance, for military maneuvering.

Mr. ARNOLD. Yes, exactly. We visualize the Navy, Air Force, Marines, and Army will have areas such as you speak of, for training, which will be restricted and will be uncontrolled except for them, acrobatic areas and training and bombing areas which you would not penetrate.

Mr. MACK. Then your idea is to control the upper airspace and not have the same regulations for the lower airspace?

Mr. ARNOLD. Exactly. For your information, last Friday we had an informal discussion with the Civil Aeronautics Board in which the CAA were there, and all users of airspace, including military services were there, and this was explained by the CAA as their plan.

The first step is to control IFR above 15,000 feet and, when they get the radar and communications, to control everything above 15,000. I will admit that the CAA says it would not be legal to do it unless there was a change in regulations.

We would have to have a requirement by the Civil Aeronautics Board in the regulations to require this.

Mr. MACK. You don't envison the positive control of the lower airspace, say from 15,000 feet or 20,000 feet on down?

Mr. ARNOLD. No, sir. We visualize that that would be a very slow process. We don't think it would be necessary in a great many areas. For example, it is impractical to control crop dusting, pipeline inspection, and many, many types of private flying, and we don't believe it is essential.

Possibly you will lower it all the way to the ground in some of the high-density areas.

Mr. MACK. Aren't they control areas anyway?

Mr. ARNOLD. Yes, sir. You made that exception in your statement. Again, I think possibly certain tunnels may be provided for uncontrolled aircraft. Certainly I think that is the process that we will go through.

Mr. MACK. You mentioned that in a high-density area, such as the Washington area, the present plan for a standard speed of 180 miles per hour. That is in effect at the present time, is it not, on an experimental basis?

Mr. ARNOLD. Yes, sir; it is. It was published in the Federal Register. First, I believe it was put out on a 6 months' trial basis. Then as I recall, it was recommended that it be extended for further evaluation.

Mr. MACK. The Washington area is the most critical area in the country, is it not, as far as controlling traffic into the airport?

Mr. ARNOLD. Sir, it gets to such a degree that, if it isn't it is awfully close to being the most difficult. When I think of Washington, I think of the east coast from Boston down to Richmond, and practically all the way to Pittsburgh. That, to me, is the most highly congested area in the world.

Mr. MACK. You were not speaking just of this high-density area here?

Mr. ARNOLD. No, sir.

Mr. MACK. I believe that is all.

Mr. HARRIS. Would you agree, General Arnold, with the program outlined, I believed, by Mr. Pyle, of invoking positive controls at 25,000 feet and above at the time the new jets come into operation, and

then a year or so later, when we get the equipment in, to lower that level to 15,000 feet?

Mr. ARNOLD. Yes, sir. We have no objection. In fact, we think it is a step in the right direction in the improvement of safety and flexibility toward an integrated system.

We believe, on the basis of what they have stated, and their method of approaching it, that it is sound. I think it is a problem of integration and how they move toward the accomplishment of it.

Mr. HARRIS. In other words, you recognize that total and positive control is the answer?

Mr. ARNOLD. Yes.

Mr. HARRIS. But you also recognize, because of the limitations of available facilities, it cannot be invoked suddenly?

Mr. ARNOLD. That is correct, Mr. Chairman, at least in our belief.

Mr. HARRIS. What would be your comment as to a requirement of all commercial airlines to follow airways?

Mr. ARNOLD. Mr. Chairman, if I could possibly give my definition of airways——

Mr. HARRIS. Airways established by the CAA.

Mr. ARNOLD. As we presently conceive of our Federal airways system, the airways today do not extend above 14,500 feet west of the 100th meridian, and above 12,500 east of that. Below that level, we believe that it would cause undue congestion and would slow up the progress in view of the fact that the CAA is not capable of handling the traffic. Also, we have the problem of operating—I think it is over 200 or 300 places or areas that are not on the airways.

There are something like 37,000 route miles flown every day that are not along an airway.

Mr. HARRIS. In order to establish airways, it would require more facilities?

Mr. ARNOLD. That is correct.

Mr. HARRIS. Those facilities being available and proper highways of the air having been established, you think it might be advisable?

Mr. ARNOLD. Yes, sir. We have requested and the air carriers have individually requested to have all their routes designated along the airways. Some of them, naturally, will come along very slowly, but I think that is the goal, yes, Mr. Chairman.

Mr. HARRIS. In connection with this positive control program, you think private flyers should not be included?

Mr. ARNOLD. We are talking about everday flying, VFR or IFR, Mr. Chairman.

Mr. HARRIS. You are speaking, I believe, in your statement on page 3, about the right of private fliers.

Mr. ARNOLD. Yes, sir.

Mr. HARRIS. You do not want to impose a hardship.

By undue hardship, we mean that we would expect the system to permit the steady expansion of private flying on a safe and stable basis.

I was wondering what you meant by the right to a private flier, whether or not he would have to come under the same control and regulation.

Mr. ARNOLD. No, sir. In the visualization of this problem, in order to expand on that particular point, our concept would be that

you would lower this level in which you would have complete control of the airspace above a certain level at a particular spot.

The level of that floor would not be the same throughout the country. Where those areas do not extend to the ground, I do not think it is necessary for the private pilot to fly along the airways. One of the problems we have today is that we are developing one-way airways.

If I am proceeding down a one-way airway on instruments, how am I to cross that if I am flying VFR without interfering, possibly going head-on into another aircraft? There isn't the problem here of intermediate altitudes because everybody is going one way, and they are 1,000 feet apart.

So it is a rather tight squeeze in here. That is the difficulty of uncontrolled area. If we are to have these areas where there is control, then if an uncontrolled flight is going to penetrate it, we must know of its presence.

That is the best answer I can think of, Mr. Chairman, to try to explain it.

Mr. HARRIS. In other words, then, it would be correct to say the statement I made is true with the exception of the fact that private flyers have to stay out of certain areas?

Mr. ARNOLD. Yes, unless they want to come under control.

Mr. HARRIS. In that instance, they would have to have the same type of equipment, some of which is rather expensive and some of which is already there.

Mr. ARNOLD. If I might mention, there are literally thousands of private aircraft that have no flight instruments in them, and there is no necessity for them.

Mr. HARRIS. That aircraft, then, could not enter this partiular area?

Mr. ARNOLD. No, sir.

Mr. HARRIS. You think the low-frequency ranges should be done away with?

Mr. ARNOLD. We feel it would be in the interest of safety and improving the efficiency of the requirements of expanding traffic control to do away with the low-frequency range a year or 2 years from now; yes, sir.

Mr. HARRIS. Does that mean this system of going on beams would be done away with?

Mr. ARNOLD. No, sir. The instrument-landing system, of course, is VHF. This would be the old four-course radio range as we know it.

Mr. HARRIS. That is what I am talking about, where you fly on an audible signal. You think those ought to be done away with?

Mr. ARNOLD. Yes, sir. We feel that progress has been made sufficiently to discard those.

Mr. HARRIS. Would that affect a great many private fliers?

Mr. ARNOLD. No, sir. Rather strangely, I don't think it would. I know that in their most recent statement, nobody is a greater advocate of the VOR today than the private flyer, because it has a great deal more flexibility, and relatively cheap and very satisfactory transceivers are being put on the market.

Mr. HARRIS. Could you indicate what percentage of planes today have this type of equipment?

Mr. ARNOLD. As far as the airlines are concerned, as I recall it is pretty close to 99 and a fraction, so close to 100 percent that we can call it 100 percent equipment. The military have given it out, and I think approximately 2 or 3 years ago both the Navy and Air Force embarked upon the purchase of a considerable number, in 2 figures. I believe you recall in the DME information they gave you, which I am not sure is classified or not, but certainly in the thousands of VOR's, which they are programing to go into their aircraft.

I would like to ask Mr. Timmerman if he recalls the statement by the Corporate Business Private Pilots the percentage they have equipped on VOR.

STATEMENT OF CRAIG F. TIMMERMAN, AIR TRANSPORT ASSOCIATION

Mr. TIMMERMAN. I don't believe I can repeat the number they have equipped, but they have said on behalf of their organization publicly that they are ready to do away with the low-frequency facilities, provided, of course, they are replaced with the omni facilities.

Mr. HARRIS. General, does the Air Transport Association concur in the statement which was given to us today on the VORTAC program?

Mr. ARNOLD. Yes, sir; wholeheartedly, Mr. Chairman. We think the Government is to be commended for finally developing a solution which, from all the information we have, the military and civil aviation have agreed is the practical solution for the best use of this equipment, satisfying the needs of the users and providing for the expansion of the traffic control system.

I think that is very vital.

Mr. HARRIS. Are you satisfied that it is not only a practical situation, but a workable situation?

Mr. ARNOLD. We believe so. Mr. Chairman, we have gone to the extent of having a series of meetings with people who we think are some of the most capable in the business, namely, communications and operations people of the airlines who are going to be faced with this problem of the purchase of equipment and making it work one way or the other.

We have obtained specific information from manufacturers, and then we have taken that information on dates, cost, specifications, and the airlines have agreed that it is practical and workable and that we can purchase the equipment in time to use it when the facilities are equipped on the ground.

Mr. HARRIS. Do you know what the position of the Aircraft Owners and Pilots Association is regarding this new agreement?

Mr. ARNOLD. Sir, I think that I probably would not do them justice to try to paraphrase it, but as I recall last week they officially notified the CAA that they had agreed to the VORTAC decision.

As I recall, I was in Mr. Pyle's office, or someone's office in the CAA, and they mentioned the fact to me that they had just received official notification.

Mr. HARRIS. Now, I do not see it readily here, but you mentioned something about development of a warning device in the plane to avoid collision. Would you give us a little further explanation about progress of such a device?

Mr. ARNOLD. Yes, sir, Mr. Chairman.

It so happens that it was worded this way because at the time I thought we were testifying earlier, and we have been attempting as rapidly as possible to finalize the technical problems and the problems of timing and the type of equipment and how we could purchase it as quickly as possible, having started on the program approximately 2 years ago.

We are happy to say that a public announcement will be made on this tomorrow morning. It was released to the papers, put in the mail on Wednesday afternoon, and it was given to the press for release on Friday. It was a specific announcement of the fact that we have approved and recommended the purchase of a specific piece of equipment which is known as a proximity warning indicator.

We are satisfied that the equipment will work and will be practicable. This is a two-phase program. One is that we are satisfied that known techniques today of a proximity warning indicator are well known and established. We have thoroughly investigated them with the most capable people we have in the industry, and therefore it is a matter of determining the development and the production of this equipment. It is approximately 20 months from today or approximately 20 months from November—excuse me, from October—which we visualize the production line will start rolling on this piece of equipment.

The second phase is what we call an anticollision warning indicator.

Now, Mr. Chairman, the difference, the two reasons, are these:

One is that the records of the Civil Aeronautics Board show that the greatest exposure rate on collisions, by that fatal accidents, between military and civil aircraft, between civil and civil—we do not have factual information on military versus military except what we read in the papers—is that it is a slow-closure rate.

It so happens that technically and operationally the problem of solving this is much easier than the high-closure rate and the natural attendant difficulty of searching the sky. There is some basic research that has to be done on that. That is the second phase of it.

Consequently, the operational parameters have been set, such as, let us say, the closure rate, where it is less than 100 miles an hour for a round number. This device will operate and work and warn the pilot in sufficient time that he can develop an escape maneuver.

That is the status and we are very pleased, and I think again that the work of the VFR Committee, which first developed the necessity for this, and also the requirements which were first put out on this piece of equipment to over 600 electronic manufacturers in the spring of 1955, has resulted in this finalization of the problem which we feel will be a satisfactory improvement in safety.

Mr. HARRIS. What was the first thing it would do?

Mr. ARNOLD. Proximity warning, Mr. Chairman. It will give the pilot an indication of the closure rate of another airplane when the closure rate is relatively low.

Mr. HARRIS. What do you mean, closure rate being relatively low?

Mr. ARNOLD. Two airplanes coming at each other at 400 miles an hour comes to 800 miles an hour.

Mr. HARRIS. Yes.

Mr. ARNOLD. The problem associated with this, as you may recall Dr. Furnas and others said, is a very difficult problem. It is one

of a machine that must work up and compute speeds, it must develop a parameter very rapidly whether the airplane is what we might call a bogey or one which will or will not. It must search the whole sky.

The problem develops into one of very, very basic research, not just development but some basic research must be done in this field. That is what we call the high rate of closure and which we call an anti-collision warning indicator. That is what we call the second step of this.

Mr. HARRIS. What you estimate the rate to be of this first phase?

Mr. ARNOLD. Speaking in general terms of 100 miles an hour.

Mr. HARRIS. In other words, it would be a warning if the planes were approaching each other at 200 miles an hour?

Mr. ARNOLD. No, sir. It would have to be a closure rate of less than 100 miles an hour.

Suppose you got 2 airplanes approaching each other at 40 miles an hour. The 1 is going 300 and the other is going 260 miles an hour, and they are headed, let us suppose, on a parallel course that will come out 40 miles an hour. This device would then warn.

Mr. HARRIS. In other words, had you had something like that on the two planes over the Grand Cayon, it probably could have given a warning, assuming that it happened as apparently we all believe?

Mr. ARNOLD. Yes, sir.

I listened to the testimony and, as I recall it, the one point that the Bureau of Standards and the technical group had not firmed up was as to the closure rate and speed of impact.

Maybe I am wrong but I think I have heard various parameters, but as I recall it has not been determined exactly.

I assume, like you do, from the scanty information I have that this device would come within that limitation.

Mr. HARRIS. My question was based on the assumption that planes were very likely going pretty much in the same direction.

Mr. ARNOLD. Right.

Mr. HARRIS. And coming together, as it has been indicated, at least we obviously think they were, such a device would have warned the pilot in ample time.

Mr. ARNOLD. Yes, sir. You are quite right, Mr. Chairman, it is envisioned that if this equipment works as we feel it will that such a device would have warned either one of the pilots. Had both aircraft been equipped, it would have warned both.

Mr. HARRIS. The other phase that you speak of, when finally developed, will take care of a head-on collision?

Mr. ARNOLD. Yes, sir.

I think there is one other point, Mr. Chairman, to mention, which I think is rather important in this device. Operationally, we felt that it was impractical to make a cooperative system because it would require equipment to be put in every aircraft. Technically, it is much easier to design a piece of equipment that is cooperative, but we felt, by that, the Airline Technical Committee and the Operational Committee, that the system must be self-contained; that the piece of equipment warns of any aircraft, regardless of whether it is equipped or not.

From that standpoint, we feel the solution of the problem is much sounder but it is more difficult technically.

Mr. HARRIS. How much do you think this kind of equipment might cost?

Mr. ARNOLD. We have gotten pretty close to that. It would cost approximately six or eight thousand dollars apiece.

Mr. HARRIS. Everyone is in favor of safer traveling, of course, but the thought occurred to me that we will have a plane so full of equipment that you will not have room for anything else.

Mr. ARNOLD. I believe that when the electronic gear meets the galley that we will then be out of business, sir.

Mr. MACK. I just wanted to ask on this policy of eliminating the low-frequency ranges.

You say you think it would be done within a 2-year period?

Mr. ARNOLD. Yes, sir.

Mr. MACK. I am wondering with the present program that we have for converting into this VORTAC system if it would not be advisable to have the existing facilities until such conversion was made, since all of the planes are equipped for the low-frequency reception and it would be a safety factor to have that in use during that period?

Mr. ARNOLD. Mr. Mack, I see your point.

I think there again, and I may be entirely erroneous, but it would not create a hardship on civil aviation. The problem here is on military aviation as to the programing if they will have sufficient ground stations of their TACAN or VORTAC installed before they pull out some of their low-frequency airborne. Is that possibly your thinking on it?

Mr. MACK. I would include the civil flying.

Mr. ARNOLD. From the standpoint of commercial flying, and I think, generally speaking, the business aircraft are all equipped with VOR, and as Mr. Timmerman mentioned, the private pilots have officially stated that they are ready to discontinue the low frequency tomorrow.

Mr. MACK. Some of the testimony that we had would reveal that there is a certain conflict of frequencies in phasing out the omniranges and replacing them with VORTAC in more or less isolated areas. It occurred to me that there would be some instances where there would be, whatever you want to call it, conflict, between the two systems.

Mr. ARNOLD. Well, I do not recall any conflict that will result in the VOR and the TACAN. As I gather, there is no conflict between either one, and the low frequencies, 200 to 400.

Mr. MACK. That is true, but as I understand it, there are some certain channels that are presently being operated VOR, presently operated on these channels, that might of necessity be used in the VORTAC installation. It was my understanding that that was the case in isolated areas. They are not certain of it at this time, but, as a system is developed, it is entirely possible that they will find that conflict in certain areas.

Mr. ARNOLD. I see; yes, sir. Well, that is true. It is this pairing problem and possibly it is some of the technical problems associated with the pairing, and your point is that until that time we should have a back-up of the low frequency?

Mr. MACK. Yes.

Mr. ARNOLD. I can see, Mr. Mack, that you would have some exceptions where we might be required for some various procedures and reasons, say, to keep two of them in the New York area or some area where we were having this difficulty on the pairing problem, yes.

Mr. MACK. I understood that you were recommending that we abandon the entire system in 2 years?

Mr. ARNOLD. Well, no sir; I do not think we are going to get the entire VORTAC system in any 2 years.

Mr. MACK. I am speaking of the low frequency.

Mr. ARNOLD. Oh, getting those out in 2 years.

Well, we feel that any exception, of course, is not necessarily, does not preclude, the general attempt and I think the way it has been done, Mr. Mack, is that each CAA region bring the location of each facility in, low frequency in. The users of airspace are invited to come in. The procedure is tied in with that. They look at it and say, "Will this hamper our operation, Mr. Navy? Mr. Air Force?" and right on down to the private pilots.

If everyone says, "No, we can get along with this," it comes out. If we have, in addition to that, a general directive from the CAA, which I guess is the proper agency for this, then I think that it could move a little more rapidly.

Mr. MACK. What is the advantage in having it eliminated in a 2-year period rather than a 5-year period?

Mr. ARNOLD. Many, many places, you have your old low-frequency ranges that might be, let us say, 3 miles south of your present VOR's.

Mr. MACK. Yes, but do you not have a separate airway system for that?

Mr. ARNOLD. Unfortunately, it is a pretty sad situation when you look at it.

Mr. MACK. It was my understanding that they file their flight plans if they are going to use the VOR and they refer to what we refer to as a Victor plan.

Mr. ARNOLD. That is correct, but quite often you will have aircraft, particularly coming in the high density areas and also in some areas crossing airways Victor and others that are equipped with low frequency. Then the control is uncoordinated and the other flow of traffic must stop generally in order to accommodate the aircraft that is using the low frequency.

Mr. MACK. Well, then, your idea is to eliminate our dual system airways at the earliest practical time?

Mr. ARNOLD. Yes, sir.

Mr. MACK. Do you have in mind also eliminating your homing stations that are operating on low frequency?

Mr. ARNOLD. You mean your markers, inner and outer markers?

Mr. MACK. No, sir; your low frequency homing stations, such as Springfield out here and such as that.

Mr. ARNOLD. No, sir.

Mr. MACK. Georgetown?

Mr. ARNOLD. We do not visualize that we are going to be able to do without that type of marker as well as the outer marker and the middle marker on the ILS for a long time.

You speak of Springfield and Georgetown and others which are not the true ones on the instrument-landing system but are holding areas and fixes.

Mr. MACK. Yes, I meant holding points rather than your instrument-landing system.

Mr. ARNOLD. Well, there are two ways to go about that.

We think that one of our best pieces of equipment is the ADF, but it is awfully good to have something else up there such as will

give us the combination of fixing a position. It is dependent upon equipment of all users of airspace.

VORTAC, theoretically all military and civil could use a heading and distance information on a radial. I personally do not see what we are going to do, namely, the nondirectional low frequency holding spots for many, many years.

I can be corrected, but I have had very little success with finding out any great development program that anyone feels very satisfied with in the VHF band for a nondirectional beacon.

Mr. MACK. Then when you eliminate the low-frequency-range stations, you are going to have to replace them with homing facilities? Would you think that would follow?

Mr. ARNOLD. That would follow where that low-frequency range is being used primarily as a holding fix and a great number of them are, as you have pointed out.

We hope, with the employment of the VORTAC, to have a greater flexibility of holding fixes, of intersections, and this is one of the problems that has kept the low-frequency range in being, and very honestly, it is because we could not measure the width of that, that being the low frequency on course signal and we could measure very accurately the width of the VOR. The width of it is a little surprising when you intersect 2 radials, as you know, 40 miles apart. Pretty soon in an area, you run out of holding areas.

I do not think that the low frequency has given us any better system from a safety standpoint. It has only given us a false sense of security that because we could not measure the width of that low-frequency beam and its intersection, we have assumed that it is almost two lines coming together. We have used those intersections where the others are 15 miles on a square.

But you are quite right in the fact that the intersection problem and the holding fixes is one of the most difficult transitions.

Mr. MACK. Today, what percentage of your traffic is on the low-frequency airway and on a Victor airway?

Mr. ARNOLD. Well, that is nationwide.

Can I ask Captain Jensen?

Can you guess on that one? I can guess on high density areas.

Mr. JENSEN. That is daily changing in favor of going over to Victor system, which is based on the VOR, and I would imagine, and this is only a guess, that it is now predominantly VOR.

Mr. MACK. That is as far as your commercial airlines are concerned?

Mr. JENSEN. Yes.

I would even guess, and this is only a guess and I do not know anyone other than possibly some of the CAA people who could give detailed information, I would guess that there is probably more instrument flying today done on the Victor airway system, which is the VOR, omnirange airway system, than there is on the color on low-frequency system, mainly because this process of retiring the low-frequency ranges and replacing them with omniranges has been going on, as you know, for some period of time and the transition is continuing.

Mr. MACK. You have had a substantial move in that direction, a transition in the last year. Would that be correct?

Mr. JENSEN. I think so.

You did say one thing, though, Mr. Mack, that I would like to clarify, and that was the mention of conflict between VOR and VORTAC.

I hope it is clearly understood that VOR is part of VORTAC system.

Mr. MACK. I understand that.

Mr. JENSEN. There is no retirement of VOR in the VORTAC system.

Mr. MACK. However, there will be a conflict in the installation of stations, and that would be on the DME distance-measuring equipment that is presently located as it is replaced with the VORTAC; is that correct?

Mr. JENSEN. Yes, because I would want to emphasize the fact that VOR is a part of the VORTAC system, and is not being transitioned away from, or is not to be retired, but will actually be augmented and is a vital part of VORTAC system.

Mr. MACK. I am aware of that.

Perhaps you can answer my question if I ask again if there is any necessity for having a low-frequency facility at the time of the phasing out of one navigational system and introducing the other?

Mr. JENSEN. In my estimation, the operation of VOR and VORTAC causes no difficulty whatsoever on the low-frequency aids retirement program except for the airborne implementation of aircraft that are confined to low-frequency receivers and, as has been stated, that is at a minimum now and is being reduced, so there is no other conflict that I know of that is involved because VOR's are in being and will continue to be in being and VORTAC has no problem there, and the low frequency is something apart from that.

Mr. MACK. In other words, when they replace your present system with VORTAC, there would be continuous operation of your present navigation facilities; is that your statement?

Mr. JENSEN. Not exactly. There would be continuous operation of VOR as a part of the VORTAC system.

Mr. MACK. I am glad that you corrected me. That is the reason that I asked the question, was that if it is necessary to have some navigational facility or if it is necessary to interrupt operations, then I think it would be advisable to have your low-frequency facility in operation at the time.

Mr. ARNOLD. The CAA in their 3-year program have required the purchase of 80 additional VOR's to be installed. Then all you are going to do is to put a minimum number of TACAN's to provide for commercial and military operation along the airways, colocate them, and we visualize for a round number 1,000 feet apart, and then as you implement the TACAN at a maximum number, you gradually decommission the distance-measuring portion of the VOR at the VOR site. Then you have a problem of channeling or cochanneling, so that when I come along and I tune in the VOR for this station I get the distance portion from the station that is 1,000 feet from me.

Mr. MACK. In other words, you are planning to use your same transmitter?

Mr. ARNOLD. Our same receiver for the VOR. We will buy a commercial version for TACAN distance.

Mr. MACK. You are planning to use the same transmitter, VOR transmitter, on the ground facility as you install your VORTAC system?

Mr. ARNOLD. Yes, sir.

Of course, we in the airlines use a separate one in addition to using it on the glide path in the receiver. But private flying uses a combination and, consequently, this will have no effect on it but to keep the voice override available on all the VOR's, and that is very important to commercial aviation.

Mr. MACK. Then the VOR transmitter will remain in continuous operation?

Mr. ARNOLD. Yes, sir.

Mr. MACK. The same transmitter at the time they install VORTAC?

Mr. ARNOLD. That is right.

Mr. MACK. I thank you very much, General, for your statement and especially for clearing up that one question that I had in my mind.

That is all, Mr. Chairman.

Mr. HARRIS. General, thank you very much. We appreciate very much your testimony here and the information you have imparted to the committee.

Mr. ARNOLD. Mr. Chairman, thank you and the members of the committee. We appreciate your very helpful indulgence in assisting us in these problems.

Mr. HARRIS. Mr. Larry Cates, representing the Airline Pilots Association?

You probably would like to make a statement regarding the position of your association regarding this VORTAC decision?

Mr. CATES. The Airline Pilots Association has not endorsed VORTAC. It is not the policy of the association to endorse any tool or equipment until it is thoroughly tested and in operation.

Mr. HARRIS. We are very glad to have that information for the record.

This concludes the hearing scheduled for this session of the committee meeting, and the committee will adjourn until further notice.

(Whereupon, at 4 p. m., the subcommittee recessed, subject to the call of the Chair.)

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